ENGINEERING NEWS-RECORD

OCTOBER 8, 1942

STARTING ON PAGE 81

Sewage Disposal

PRACTICE IN WARTIME

New information on designing treatment facilities for war production plants, building concrete tanks without steel, estimating flow relationships, and processing industrial wastes prior to disposal.

Also INCLUDED IN THIS ISSUE

Road Work Under War Restrictions—Building highways and maintaining existing roads to serve industrial and military needs is the No. 1 problem of highway engineers. How some of them are meeting restrictions on materials and equipment is reviewed on page 74.

Strategy and Tactics on a Waterworks Project—Providing larger supply facilities in the Hampton Roads area is a battle of wits, with engineers and contractors resorting to many ingenious and some unorthodox procedures to complete the job.

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You have probably often wished for nails with the corrosion-resisting qualities of old wrought iron nails, and the current activity in water-front construction has emphasized the need. Now you can get them for rated projects.

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Furthermore, the modern product is a cut nail, duplicating the original in design. Tests have shown the holding power of cut nails averages over 70% greater than that of equivalent wire nails . . . a big consideration now that metal conservation is so vital.

It should be understood that the A. M. Byers Company does NOT manufacture nails, but merely provides nail manufacturers with the genuine wrought iron from which they are cut. If you have any construction job essential to the war program where permanence and dependability are important, and where severe corrosive conditions are present, we will be glad to furnish you with the name of a source of supply.

A. M. Byers Co. Established 1864. Offices in Pittsburgh, Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

The two wrought iron nails lying on the timber are over a century old. Note uniformity of section, and absence of any severe pitting or localized corrosive attack.

Corrosion costs you more than Wrought Iron

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ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewers, Waterworks, Bridges, Roads, Dams, Foundations, Earthwork, Flood Control, Public Works, Shipbuilding, Irrigation, Canals, Railroads

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Vol. 129 OCTOBER 8, 1942 No. 15

COMING NEXT

• War Buildings of 1942—a 32-page special section devoted to design, planning and construction of outstanding war-inspired factories, office buildings, military and naval structures, which has made the present year one of the most notable on record. In the face of material shortages and imposed demands for speed, the job of supplying these vital buildings required ability and ingenuity. Many precedents have been set that no doubt will become standard practice in the future.

• A method of field control for tamped earth construction, based on seven years of experience in the Tennessee Valley area, will be described by F. A. Kellog, senior materials engineer of TVA. This method has eliminated the most serious objections to control by test. Its simplicity and speed permit it to be used on small operations that ordinarily might not be controlled.

• How the problem of leveling up uneven reinforced-concrete piles was solved by the unique use of precast concrete jackets, placed on top of the piles, is an interesting innovation that will be described in the October 22 issue.

LOOKING AHEAD

• With the loss of the Philippines and the fall of the Dutch East Indies, the supply of manila rope to this country ceased, thus imposing the difficult problem of conserving present stocks and finding available substitutes. The ever-expanding demands of war make it vitally necessary that this product be conserved to the utmost and substitutes be known and used wherever possible. To this end, the results of a thorough study of the problem will be presented in an early issue.

• Snow will soon be banking up on airports in many sections of the country, thus preventing the efforts of our boys to "Keep 'Em Flying." Best practices in snow removal, based on experience of leading airport managers in the U. S. and Canada, will be the subject of an article scheduled for the November 5 issue. Fields for both wheel and ski landings, and Canadian methods of compaction, rather than removal of snow, are described.

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Your nearby Ryerson plant carries reinforcing bars, wire mesh, structurals, roofing... and practically every form of construction steel and allied products . . . in stock for immediate shipment.

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Complete Facilities for cutting, bending or forming Reinforcing steels to specification.

Prompt Deliveries to meet your day-to-day job needs and keep materials coming on schedule.

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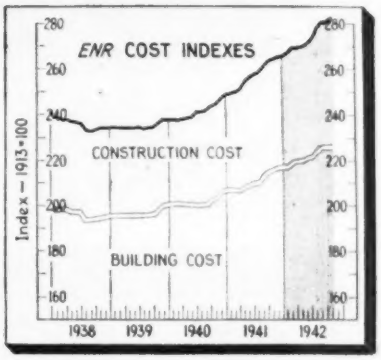
MONTHLY CONSTRUCTION BUSINESS SUMMARY

ENR CONSTRUCTION VOLUME AND NEW CAPITAL . . . . FHA MORTGAGES

(,000 omitted)	September 1941	September 1942	% Change	Nine Months 1941	Nine Months 1942	% Change
Total Construction	$514,251	$712,709	+39.0	$4,843,878	$7,632,606	+58.0
Private Construction	73,169	38,223	−48.0	966,938	474,740	−51.0
Public Construction	441,055	674,486	+53.0	3,876,940	7,157,866	+85.0
Federal	363,169	646,380	+78.0	2,911,089	6,718,277	+131.0
Total New Productive Capital	$457,416	$11,957	−97.0	$5,860,877	$9,530,701	+63.0
Private Investment	28,637	10,921	−62.0	656,099	351,648	−46.5
Federal (non-federal work)	250	1,036	+314.0	378,660	212,155	−44.0
Federal (federal work)	428,529	.....	.....	4,826,118	8,966,898	+86.0
FHA Mortgages selected for Appraisal (Title II)	$112,176	$26,347	−77.0	$1,124,067	$456,055	−59.0
(Title VI)	14,922	66,016	+343.0	125,413	588,518	+369.0



CONSTRUCTION COSTS . . . . WAGE RATES . . . . PRICES

	October 1941	October 1942	% Change	Change Sept. to Oct. 1941 Sept.	1941 Oct.	1941 %	Change Sept. to Oct. 1942 Sept.	1942 Oct.	1942 %
E N R Construction Cost Index, 1913=100‡	264.46	282.44	+6.8	263.12	264.46	+0.5	281.61	282.44	+0.3
E N R Building Cost Index, 1913=100‡	215.92	225.90	+4.6	214.58	215.92	+0.6	225.46	225.90	+0.2

‡ *Does not reflect increased costs due to more overtime, lower labor efficiency, delivery delays, etc.*

ENR 20-CITIES' AVERAGE

	October 1941	October 1942	% Change	Change Sept. to Oct. 1941 Sept.	1941 Oct.	1941 %	Change Sept. to Oct. 1942 Sept.	1942 Oct.	1942 %
Common Labor	$0.761	$0.826	+8.5	$0.761	$0.761	0	$0.823	$0.826	+0.4
Skilled Labor (Av. 3 trades)	1.516	1.589	+4.8	1.516	1.516	0	1.586	1.589	+0.2
Bricklayers	1.608	1.687	+4.9	1.608	1.608	0	1.687	1.687	0
Structural Ironworkers	1.582	1.644	+3.9	1.582	1.582	0	1.637	1.644	+0.4
Carpenters	1.358	1.435	+5.7	1.358	1.358	0	1.435	1.435	0
Cement, per bbl	$2.52	$2.60	+3.2	$2.52	$2.52	0	$2.61	$2.60	−0.4
Reinforcing steel, per cwt	2.59	2.72	+5.0	2.59	2.59	0	2.69	2.72	+1.1
Struct. steel shapes, base	2.10	2.10	0	2.10	2.10	0	2.10	2.10	0
Sand, per ton	1.18	1.19	+0.8	1.18	1.18	0	1.21	1.19	+1.7
Lumber, 2x4 Fir, per M ft.	46.47	51.55	+10.9	44.72	46.47	+3.9	51.10	51.55	+0.9
Lumber, 2x4 Pine, per M ft.	40.71	44.24	+8.7	40.01	40.71	+1.7	44.27	44.24	−0.1
Brick, common, per M	14.91	15.58	+4.5	14.83	14.91	+0.5	15.63	15.58	−0.3
Ready-mixed concrete, c.y.	7.07	7.34	+3.8	7.07	7.07	0	7.34	7.34	0
Struct. clay tile, 3x12x12	76.69	77.97	+1.7	75.99	76.69	+0.9	77.97	77.97	0
Paving asphalt, cars, ton	14.68	14.92	+1.6	14.63	14.68	+0.3	14.92	14.92	0

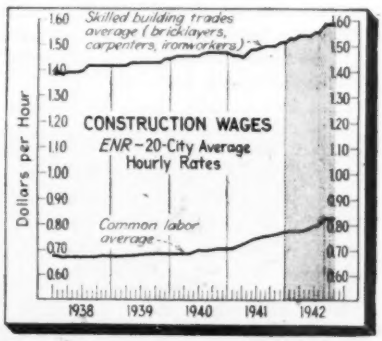
ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Oct., 1942	282.44	135.77	225.90	122.11	.....	.....
Sept., 1942	281.61	135.37	225.46	121.88	544	238
Aug., 1942	281.61	135.37	225.39	121.84	622	273
July, 1942	277.65	133.46	223.45	120.79	736	323
June, 1942	274.19	131.80	221.18	119.56	752	330
May, 1942	272.30	130.89	220.14	119.00	821	360
April, 1942	271.78	130.64	219.55	118.68	569	249
Mar., 1942	269.71	129.65	218.88	118.32	578	253
Feb., 1942	269.41	129.51	218.44	118.08	507	222
Jan., 1942	267.63	128.65	217.12	117.37	402	176
Dec., 1941	266.16	127.94	216.37	116.96	217	95
Nov., 1941	266.13	127.93	216.54	117.05	282	124
Oct., 1941	264.46	127.13	215.92	116.72	263	115
Sept., 1941	263.12	126.48	214.58	116.00	419	184
1941 (Av.)	257.84	123.95	211.46	114.32	375	164
1940 (Av.)	241.96	116.31	202.81	109.64	269	118
1939 (Av.)	235.51	113.21	197.44	106.73	211	92
1938 (Av.)	235.86	113.34	196.83	106.40	197	86

MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	September 1941	September 1942	% Change	Aug. 1942	% Change Aug.-Sept.
Lumber (% 1935–'39 weekly seas. av.) N. L. M. A.	146.0	132.0	−9.6	142.8	−7.6
Steel (% operating capacity) A. I. S. I.	96.7	96.8	+0.1	97.2	−0.4

	August 1941	August 1942	% Change	Eight Months 1941	Eight Months 1942	% Change
Fabricated Structural Steel, tons, A.I.S.C.	189,251	165,212	−12.7	1,470,547	1,425,518	−3.1
Cement, thous. bbl., U.S.B. of M	17,825	21,282	+19.4	106,156	121,127	+14.0
Building Permits, Dun & Bradstreet, (,000 omitted)	$119,251	$52,706	−55.9	$1,032,977	$622,621	−39.7



COST OF LIVING INDEXES . . . . EMPLOYMENT

	August 1941	August 1942	% Change	July 1942	% Change July-Aug.
Cost of Living Index, N.I.C.B.	88.6	98.1	+10.7	97.8	+0.3
Rent (Housing) Index, N.I.C.B.	89.4	90.8	+1.6	90.8	0
Total Employment (est.) thous., B.L.S.	35,145	37,667	+7.2	37,100	+1.5
Construction Employment (est.) thous., B.L.S.	2,630	2,328	−11.5	2,310	+0.8

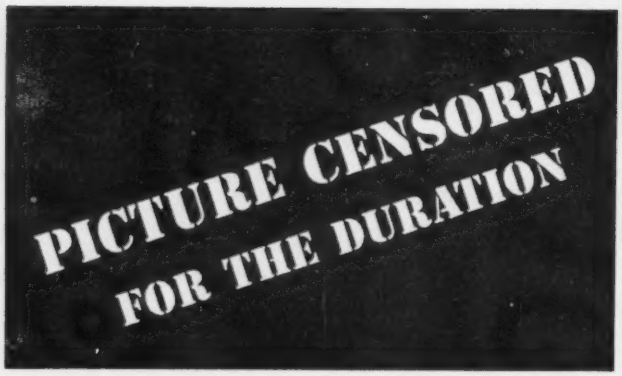
ENGINEERING CONSTRUCTION CONTRACTS—ENGINEERING NEWS-RECORD——SEPTEMBER, 1942

Engineering News-Record *reports projects of the following minimum costs — waterworks, excavation, drainage and irrigation,* $15,000; *other public works,* $25,000; *industrial buildings,* $40,000; *other buildings,* $150,000

Four Weeks — Thousands of Dollars (000 Omitted)

	New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	United States September 1942	United States Nine Months 1942	United States Nine Months 1941	Canada
Public Works										
Waterworks	712	4,151	5,344	3,203	5,168	1,345	**19,923**	**116,667**	60,647	150
Sewerage	133	612	2,124	1,424	2,701	2,756	**9,750**	**93,873**	68,603	500
Bridges, public	.....	1,565	627	439	265	240	**3,136**	**44,076**	87,069	285
Earthwork and waterways	1,525	350	1,499	589	4,015	1,061	**9,039**	**235,529**	212,636	400
Streets and roads	820	9,239	15,815	12,083	19,355	11,222	**68,534**	**431,497**	471,761	611
Buildings, public	92,879	46,970	71,172	48,461	72,140	69,120	**400,742**	**4,741,370**	2,306,503	4,928
Unclassified, public	10,202	14,693	34,091	17,582	64,528	22,266	**163,362**	**1,494,854**	699,721	9,254
Total public	**106,271**	**77,580**	**130,672**	**83,781**	**168,172**	**108,010**	**674,486**	**7,157,866**	**3,876,940**	**16,128**
Federal government (included in above classifications)	106,036	68,860	127,710	75,584	164,568	103,622	**646,380**	**6,717,277**	2,911,089	.....
Private										
Bridges, private	.....	.....	.....	.....	.....	.....	.....	**890**	5,722	.....
Industrial buildings	642	1,625	217	1,257	1,055	942	**5,738**	**177,750**	400,162	3,665
Commercial buildings	2,328	6,075	150	1,085	2,705	4,212	**17,155**	**243,388**	395,867	150
Unclassified	784	120	6,605	.....	7,610	211	**15,330**	**52,712**	165,187	.....
Total private	**3,754**	**7,820**	**6,972**	**2,942**	**11,370**	**5,365**	**38,223**	**474,740**	**966,938**	**3,815**
Total Engineering Construction:										
September, 1942 — 4 weeks	**110,025**	**85,400**	**137,644**	**86,723**	**179,542**	**113,375**	**712,709**	.....	.....	**19,943**
August, 1942 — 4 weeks	53,164	91,156	177,010	88,290	271,603	131,854	**813,077**	.....	.....	28,991
September, 1941 — 4 weeks	20,282	59,091	99,151	48,628	188,057	99,042	**514,251**	.....	.....	23,731
Nine Months — 1942	**396,842**	**976,581**	**1,542,723**	**1,302,132**	**2,092,037**	**1,322,291**	.....	**7,632,606**	.....	**171,218**
Nine Months — 1941	251,907	945,943	1,089,141	724,829	1,168,547	663,511	.....	.....	**4,843,878**	209,057

FOR ALL-OUT SPEED in Construction!



FOUNDATIONS FOR 4½-TON LATHES READY IN 19 HOURS

• Foundations for 4½-ton lathes making 300- to 400-lb. bomb casings were needed quickly. The contractor reported that placement of Atlas High-Early concrete was completed at 12:00 noon. At 7:00 the next morning, the lathes were in place on the foundations and working.

Typical examples of "Full-Speed-Ahead" building with Atlas High-Early cement. Now is the time to put this easily available material to work.

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You will find an answer in Atlas High-Early cement for any type of construction work. Its rule is "Speed" —in building, converting, or repairing—in summer or winter. On typical jobs it has saved from one week to more than two months. And, while speeding up schedules, it often saves money on forms, curing, and protection.

Read what happened on the jobs illustrated here. On your next "Rush" contract, use Atlas High-Early and see what it will do for you. In actual application it is similar to normal portland cement and just as easy to handle. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

OFFICES: *New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, Kansas City, St. Louis, Des Moines, Birmingham, Waco.*

• The construction superintendent reported that Atlas High-Early, in addition to cutting time for completion approximately 50%, permitted earlier stripping of forms, saving 50% in form lumber costs.

SAVED 33% CONCRETING TIME

• In this 300-ft. x 600-ft. building, the contractor stated that Atlas High-Early cement cut concreting time 33% and saved 68% in rental cost of metal-pan forms.

• When munitions work called for a new 80-ft. x 300-ft. building, the company got it fast with Atlas High-Early cement. Twenty-four hours after concrete was placed the floor was in use.

ENR-H-46

ATLAS HIGH-EARLY CEMENT

A UNIVERSAL ATLAS PRODUCT

The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • OCTOBER 8, 1942 • VOLUME 129 • NUMBER 15

WPB concrete specifications established for steel saving

Second emergency structural specification made mandatory by War Production Board permits higher steel stresses, reduces concrete stresses for buildings

The War Production Board took its second step this week to put structural design on a war footing when it issued a set of "National Emergency Specifications for Design of Reinforced Concrete Buildings." This is a companion to the specification for structural steel design issued last month (*ENR*, Sept. 17, p. 1).

The concrete specification is aimed to reduce the amount of reinforcement in concrete structures. It does this by stepping up to 20,000 and 24,000 psi, respectively, the permitted stresses in structural-grade bars and intermediate and hard-grade bars; by reducing the unit design compressive stress in concrete; and by requiring the use of plain concrete wherever possible.

Use of the new specifications is a mandatory pre-requisite to obtaining priority aid for any structure. The designer must certify in writing that he has complied with the new specifications.

In addition to stepping up the steel stress from the 18,000 and 20,000 psi permitted by the American Concrete Institute building code, the emergency specification increases the stress in reinforcement of one-way slabs under 12 ft. from 50 percent to 60 percent of the yield point, but retains the existing 30,000 psi maximum. Permitted bond stresses in all types of construction are slightly increased.

The code requires that plain concrete be used "wherever practicable" in footings, walls, and piers, and that gravity and semi-gravity retaining walls and buttresses be used instead of reinforced concrete. To make these types of construction practicable more often, the allowable tension in concrete used without reinforcement is increased from 3 percent to 4 percent of the 28-day compression strength, f'_c.

In order to throw more of the load in members onto the concrete, the permitted compression stress in concrete is reduced from 0.45 f'_c to 0.35 f'_c. This will have the effect of increasing the depths of beams by about 20 percent and thus decrease the loading on the reinforcement. Use of compressive reinforcement is to be avoided wherever practicable and web reinforcement and special anchorage is to be held to a minimum.

Rodded columns must be used in preference to spiral-reinforced columns and the longitudinal reinforcement may not exceed 2 percent and may go as low as 0.5 percent, as compared with the range of 1.8 percent in the ACI code. High strength concrete must always be used in columns.

The new code was prepared under the general direction of C. L. Warwick, chief of the specifications branch of WPB's Bureau of Conservation. Work on it was started early in the year by a group, including Edwin Joyce and H. P. Bigler of Connors Steel Co. which was working on emergency steel specifications. Subsequently the job was taken over by C. A. Willson of the civil engineering section of the specifications branch, H. B. Zackrison of the Army engineers, and Cmndr. G. A. Hunt of the Navy Civil Engineer Corps.

Copies of the new code may be obtained from Mr. Colby, War Production Board, Rm. 1310, Railroad Retirement Building, Washington. If more than 25 copies are desired, correspondence should be addressed to W. L. Wyckoff, Rm. 1090 of the same building.

• • •

WPB sees big drop in war construction program

The volume of all building and engineering construction—exclusive of shipbuilding—scheduled for the war program in 1943, will drop by more than a third, it was estimated recently by the War Production Board.

The estimate of next year's construction total was made in a telegram sent by Stacy May, director of the statistic division, WPB, to the annual meeting of the American Institute of Steel Construction at Colorado Springs, Colo.

"It is expected that the volume of all building and engineering construction, exclusive of shipbuilding, scheduled for the war program in 1943 will drop by more than a third," he said. Because of the use of methods which economize on steel, and the drop in construction, it is expected that the volume of fabricated structural steel which will be required for building and engineering construction, exclusive of shipbuilding, will be substantially less than what has been used this year, and will amount to not over a million and a quarter tons."

Lumber shortage threatens war housing

The steadily tightening shortage of lumber is causing renewed doubts among federal housing officials as to the possibility of carrying out the $600,000,000 war housing program just authorized by Congress.

Despite the fact that the WPB last week agreed at least tentatively to make materials available for the program (*ENR*, Oct. 1, p. 1) many housing projects are now having difficulty getting lumber—which is raising fears for the big pending program.

Lumber shortages have been a headache to the housing agencies all this year. Last summer, the public housing program was brought practically to a standstill by a WPB freeze order limiting sale of nearly all lumber to the Army and Navy. This situation was temporarily eased when WPB made emergency allocations of lumber to housing projects. Late last August, when a permanent lumber distribution system was installed, it appeared that assignment of an A-1-a rating to housing solved the problem.

However, A-1-a is not a very high rating these days. It is topped by the AA-2X rating given—for purposes of buying lumber—to all direct war installations and the AAA assigned to high-rated military projects. Experiences in many areas indicate that the A-1-a rating will not get the lumber.

WASHINGTON HIGHLIGHTS

PRIORITY assistance in provision of air raid protection and blackout facilities for war plants will be granted only rarely in future. All requests for such assistance must be approved by WPB's Resources Protection Board. In general, WPB believes that scarce material should go into munitions rather than protective devices.

RESTRICTIONS on paving uses of petroleum products became nationwide last week when the control system was extended to the ten western states. In these states, no further deliveries of road oil are permitted. Asphalt and tar may be delivered until Oct. 15 and used until Oct. 25 on jobs now in progress. Thereafter use of oil is forbidden and asphalt and tar may be used only with the approval of the Public Roads Administration.

THE SENATE has approved an authorization for the $420,000 Gulley Brook Conduit for flood control at Hartford, Conn. The measure still has to pass the House. Although the project has considerable local support, it has never been endorsed by any of the war agencies, and it's thought unlikely that the authorization will result in early construction.

FEARS that the President's executive order on overtime pay last month might upset the overtime provisions of the construction labor stabilization agreement were laid at rest this week when the Secretary of Labor exempted construction from the order. The executive order, in an effort to simplify three-shift, seven-day operation of plants, called for the elimination of premium wage rates for Saturday and Sunday work. It provided, however, that time and a half should be paid for the sixth day of consecutive work by any workman and double time for the seventh.

THE stabilization agreement, on the other hand, permits overtime pay on week-ends but limits all overtime to time and a half. Effect of the order might have been to increase the amount of premium pay.

• • •

War halts Iceland's hot spring heating plans

The exigencies of war-time transportation have delayed Iceland's ambitious program to utilize one of that tiny country's few natural resources—hot springs —to heat homes and business houses in the capital city of Reykjavik.

The island has no known deposits of coal, oil or gas, and has depended on coal from other countries for heating.

About ten years ago the City of Reykjavik purchased a large group of hot springs, some ten miles away, and planned to pipe steam from these springs to the city for use as a heating medium. In 1937, work started and concrete conduits to house iron piping have been constructed from the springs to the city and through some of its streets.

However, a ship carrying enough pipes and machinery to complete the job was unable to leave Copenhagen, Denmark.

• • •

Navy engineers win top Welding Foundation prizes

Capt. C. A. Trexel, director of planning and design for the Bureau of Yards and Docks, Navy Department; and A. Amirikian, design engineer for the bureau, have been awarded the $13,700 grand award in the nationwide scientific welding study program sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.

Captain Trexel and Mr. Amirikian were given the award for their papers on

Mr. Amirikian

Capt. Trexel

caissons for naval drydocks that pointed out methods of making savings by the use of arc welded caissons.

The two and one-half-year welding study conducted by the Foundation, has been known as the "$200,000 Industrial Progress Award Program." It brought forth reports of welding progress prepared by executives, engineers, designers, architects, production officials and others throughout the industrial field. The study indicated a possibility of tremendous savings in costs and man hours for production of products by arc welding for both war and peace.

"Savings in critical materials and in production costs," said E. E. Dreese, chairman of the Foundation, "reported available by arc welding in the award studies, assume such proportions as to be of vital national significance. The figures indicate a possible annual cost savings of $1,825,000,000."

BRIEF NEWS

PRESIDENT Manuel Avila Camacho of Mexico has ordered placed at the disposal of the Marine Ministry a total of $105,000 for construction of a concrete breakwater at Acapulco, Pacific Coast port. Work is scheduled to start within two months.

THE Pennsylvania Railroad began construction late in September at East Altoona, Pa., on a new $410,000 steel and reinforced concrete coaling station, to have a capacity of 1,250 tons. When completed, the new station is expected to increase locomotive handling capacity on the railroad's main line from 265 to 300.

FIRST-YEAR registration in engineering at the University of Toronto (Canada) totaled 582, for what officials said was a new record. Average registration before the war was about 250.

WATER and drainage projects in several communities of the Northern district of Lower California territory, Mexico, will be advanced by virtue of a loan of $332,500 authorized by presidential decree from the National Urban Mortgage and Public Works Bank. Most of the work will be done in the border-towns of Mexicali and Tiajuana.

ALTHOUGH the Ontario Hydroelectric Power Commission has reported a serious power shortage (*ENR*, Sept. 10, p. 338), no such condition prevails in Nova Scotia, according to E. J. Cragg of Halifax, manager of the Commission. Mr. Mr. Cragg said that there has been some difficulty with water reserves, but the commission expects this to be remedied as the season progresses.

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Elmer L. Ford becomes Turner Company director

Elmer L. Ford, manager of New England operations of the Turner Construction Co., has been elected a director to fill the vacancy caused by the recent death of Arthur C. Tozzer (*ENR*, Sept. 17, p. 395).

Mr. Ford, a native of Boston, is a graduate of Harvard University and has been employed by the Turner Co. continuously since 1909.

He became a vice-president of the company on May 27 of the current year.

Nation's highway departments make plans to meet present, postwar needs

Set up projects for immediate and future work to relieve congestion. Concentrate on highway system maintenance.

Turning their eyes both to immediate and future needs of the nation's highway system, engineers and government officials last week pushed numerous plans for highway construction. Some of these were developments along the lines of the Public Roads Administration's postwar project planning program (*ENR* Sept. 24, p. 401) and some looked to immediate remedying of local conditions.

Among projects presented for immediate consideration were:

A four-lane, 17-mile highway, to be known as the Henry D. Shirley Memorial Highway extending from Occoquan Creek to the Arlington Memorial Bridge in Virginia. James A. Anderson, Virginia highway commissioner, said the PRA would put up $6,500,000 and the state $1,000,000 to cover cost of the road, which would cut four miles off the present distance from Occoquan Creek into Washington, D. C., on Route 1. Bids for construction of the two-year project will be asked soon, Mr. Anderson said.

Oklahoma City announced a program for construction of 12 miles of road to supplement its access road system carrying heavy traffic from nearby war plants and industries. The work will include construction or reconstruction on East Reno Ave., East Ash Ave., Southeast 56th St., and on county road No. 17. The project will be financed jointly by the PRA and from a $1,000,000 county bond issue voted last April.

Kentucky State Highway Commissioner J. Lyter Donaldson announced that the state had agreed to assume maintenance and improvement control over 17 sections of state and U. S. highway routes passing through Kentucky cities, under a recent act of the state legislature. Streets in Paducah, Hopkinsville, Elizabethtown, Covington, Newport, Lexington, Maysville and other towns will be taken over.

On the postwar front, a bill was introduced in Congress providing for construction of a 25,000-mile nation-wide network of military super-highways at a cost of $10,000,000,000. The bill calls for 14 future strategic routs, to be located along the seacoast and through the heart of the nation.

In New York City, the Regional Plan Association advocated the setting aside of ten streets crossing downtown Manhattan from east to west as one-way express traffic streets and the widening and improving of these streets to eliminate present delays to crosstown traffic.

At St. Louis, Mo., construction of two new routes to carry traffic from the northwest and southwest parts of the city to a point near Eads Bridge are under consideration, as is the extension of the present express highway to the foot of Douglas MacArthur Bridge and building of a new approach to route through traffic over the express highway and Clayton Road. The entire project would involve 51.7 miles of new construction.

Pittsburgh, Pa., has made available an appropriation of $400,000 for study and preparation of contract plans for a new parkway to link U. S. Routes 22 and 30 east of Pittsburgh with the city's business district. This $16,000,000 road—one of the largest highway jobs since construction of the Penn Turnpike—would run from Water Street in the downtown area, along the Monongahela River, through a 4,000 ft. tunnel under Squirrel Hill, and continue east through a ravine at Edgewood, to connect with the present highway route on Ardmore Boulevard.

Meanwhile, however, highway departments continue to make plans to maintain their existing roads in the best possible condition. At Coer D'Alene, Idaho, T. Matt Halley, state highway director announced that his department must repair and maintain its roads and bridges in as good condition under war-time conditions as in peace-time in spite of increasing restrictions on material and labor. The Indiana Highway Department, looking to a reduction of revenues due to possible gasoline rationing, also announced its program would be confined in great measure to maintenance. The Texas department added its opinion that it could expect to do little more than maintenance work during the next year.

Further information pertaining to various state highway department activities under war restrictions will be found on page 74.

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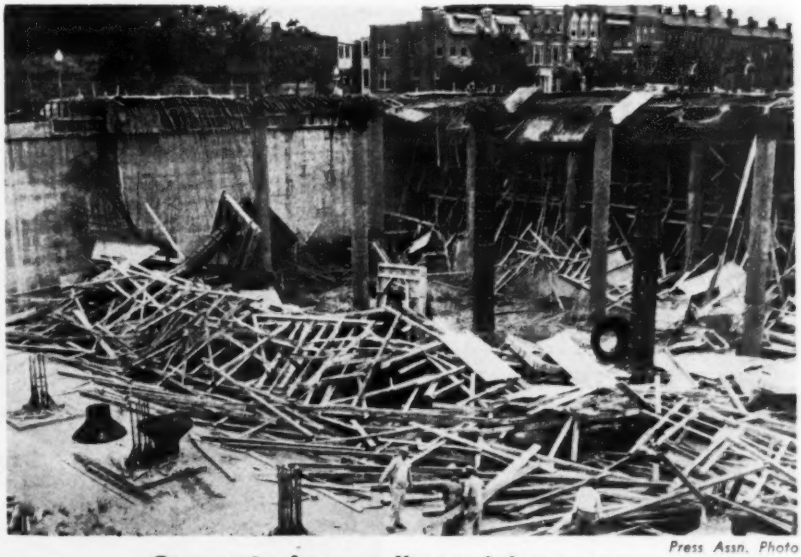
U. S. planning to acquire Allatoona Dam site

The Corps of Engineers has notified Georgia authorities that it intends to complete the plans and specifications for the power features of the Allatoona Dam project, place the power machinery on order, and acquire the dam site.

Other phases of the work on the Etowah River project (*ENR*, Mar. 5, p. 373) have been delayed because of the critical shortage of vital materials. The project's present priority rating of A-6 will not provide replacement parts for machinery broken during the work.



Press Assn. Photo

Concrete form collapse injures many

Thirteen workmen were injured recently when a concrete form holding the roof slab of a District Water Department construction project in Washington, D. C., collapsed apparently under the weight of newly-poured concrete.

The building is to house a filtration plant, and is being built by the district office of the U. S. Engineers, which has jurisdiction over water supply for the District of Columbia.

The accident occured, according to police and construction men, when scaffolding beneath the roof slab gave way over a 1,300 sq.ft. area, dropping the workmen to the floor and burying them under an avalanche of wet concrete, timber and steel reinforcement. Exact cause of the failure was not determined immediately.

Governmental units, constructors join in vast scrap metal collection drive

Goal of 17,000,000 tons must be met by December 31 to satisfy steel mill demand. Outline means of moving metal into production.

A War Production Board order last week requisitioning the old Havre De Grace bridge over the Susquehanna River in Maryland as junk metal served to highlight the tremendous urgency of the nation's current drive for scrap metal in any form, anywhere, regardless of cost.

The old bridge, replaced five years ago, is practically abandoned. Its 3,280-ft. double-deck span will yield 3,495 tons of scrap (*ENR*, Oct. 1, p. 449). It is one of hundreds of abandoned bridges, water towers, rails, buildings, mine bracings and the like that WPB officials want to see scrapped to feed the steel mills.

Scrap metal literally has become worth more than gold, in view of the fact that steel mills are dangerously close to the safety margin of scrap reserves.

Admittedly, much of the scrap needed cannot be recovered through normal salvage channels. Often the cost of recovery will exceed the money value of the scrap; sometimes, a structure which ought to be scrapped is tied up in legal or political red tape.

Procedure

To deal with situations of this sort, two organizations have been set up. The special projects section of WPB's Bureau of Conservation is a contact and promotional organization, and War Materials, Inc., an agent of the RFC subsidiary, Metals Reserve Corp., has a half billion dollars to meet the losses in getting out hidden scrap.

Commonest type of scrap which can only be recovered at a loss is old street car rails, buried in pavements. Cities or companies owning such rails should get in touch with the special projects representative at the nearest WPB regional office. He will explain the procedure. Ordinarily, the common council or other body having jurisdiction is asked to pass a resolution transferring title—for $1—to the rails to the Metals Reserve Corp.

War Materials, Inc., will then let a contract for recovery of the rails. This will ordinarily include re-paving the street. Sometimes if a street car company is obligated to remove the rails over a period of years, it will be asked to step up its operations and bear the cost itself.

For removing street car rails, WMI pays up to $55 per ton; the difference between this figure and the $18 scrap iron ceiling price set by the Office of Price Administration will finance the cost of removal, and replacement of paving.

Another situation arises when an old rail line is carrying little traffic but is kept in operation because the I.C.C. won't permit its abandonment. In such cases, if Army, Navy and the Office of Defense Transportation are agreed that there is no wartime need for the service, WPB will requisition the rail, disregarding I.C.C.

Whenever a structure can be scrapped at less cost than its salvage value, demolition should be handled on a normal commercial basis.

Any person having knowledge of the location of structures that ought to be scrapped is encouraged to write to the Special Projects Section, WPB, Washington, giving all the information available about it.

What can be done

A good example of what might be done by municipalities was contained last week in an estimate of sources of scrap submitted to WMI by Robert Moses, who heads up New York City's scrap campaign.

Mr. Moses suggested the demolition of numerous old, abandoned or disused buildings; recovery of tons of street car rails, recovery of metal and machinery held by various city departments, scrapping of old railroad bridges, recovery of metal canopies at the entrances to apartment houses, theaters and stores. These suggestions are for scrap collections in addition to the city's concentrated drive to obtain scrap of all descriptions from householders and private business establishments.

Other states, cities, counties and towns—and contractors—throughout the nation already have done much in aiding this major war effort.

The Ohio Department of Highways has started a search for abandoned, obsolete or easily-replaced metal bridges that might be broken up for scrap. In Montana, Governor Sam Ford ordered state and municipal engineers to check on old bridges; executives of New Jersey, Pennsylvania and Maryland did likewise. Manufacturers have started their own scrap campaigns among their dealers and customers, and contractors themselves have discovered considerable tonnage of disused, unuseable and obsolete machinery in their own "back yards" that can be turned in to help win the war.

Scrap Facts

A total of 17,000,000 net tons of scrap must be collected and shipped to the steel mills by December 31, 1942. The mills at present use about 2,250,000 tons of scrap per month. At that rate, if the 17,000,000-ton quota is met, the required backlog of 7,000,000 tons will be provided to tide over the mills until new pig iron production gets under way.

Press Assn. Photo

Here is municipal scrap. This pile, at Baltimore, Md., includes such heavy items as World War I tanks once used as "decorations," truck bodies, outmoded tractors and similar equipment gathered from the city's parks, shops and contractors' yards. Useful once, it can become useful again as materials of war.

Canadian water supplies under federal control

Under authority of an order-in-council that gives to the Canadian federal government control over treatment of all municipal water supplies, the city of Vancouver, B. C., has been ordered to install chlorinating equipment. City authorities are protesting the expenditure of $75,000 for the installation on the grounds that the supply "is pure according to accepted standards of quality, and the city has been consistently free of any water-borne disease."

The order-in-council, which usurps the rights of provincial health authorities and places jurisdiction of municipal water supplies under the Dominion Department of Pensions and National Health, is considered in Canada to be one of the most drastic war measures undertaken.

It gives power to the federal department to provide for the treatment of any water supplies to remove impurities and to take such steps as may be necessary to prevent pollution of such supplies. Non-compliance with these orders will result in the federal government taking over, in whole or in part, the management, control and operation of a water system.

A supply is deemed unsafe for human consumption "if it is not potable water free from pathogenic bacteria and if it contains organisms of the colon group in excess of 1 per 100 cubic centimeters of the water determined by the presumptive test for bacteriological examination. . . ."

Taking issue with this adopted standard of quality, Norman J. Howard, director of water purification at Toronto, Ont., and an international authority on water treatment, writes in the September issue of the Canadian *Water and Sewage* magazine: Water borne disease is transmitted only by a specific infective agent, and there is no evidence available to show that presumptive positive tests for the colon bacillus, which fail completely to show the presence of so-called fecal or non-fecal strains of the coliform group, are capable of causing any intestinal upset.

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Col. Arthur takes District of Columbia post

Col. Joseph D. Arthur, just returned from duty overseas, has become assistant engineer commissioner of the District of Columbia, succeeding Col. Beverly C. Snow who returns to active service at Fort Belvoir, Va.

Col. Arthur, who was U. S. Army District Engineer at Washington from 1930 to 1934, is a native of South Carolina.

Croton water system marks centennial

New York City's Croton River water supply system will reach its 100th anniversary on Oct. 14, with little more than official notice in the quarterly bulletin of the city's Department of Health to mark the event.

Wartime considerations preclude any celebration paralleling the "grand military and civic procession" which signalled first use of the water on Oct. 14, 1842, when a general public holiday was declared.

The old Croton Aqueduct, still in use, was built in the years 1837-1842. Beginning at Croton Lake it follows the Croton River to a point near its mouth and then the Hudson River to Yonkers, paralleling the Harlem River thence to High Bridge in the Bronx, where it crosses over the Harlem valley and flows to a receiving reservoir in Central Park. The standard section is founded on concrete with rubble masonry side walls and lining of brick. The aqueduct system, repaired frequently, is capable of delivering about 45 mgd. at this time. The new Croton Aqueduct, second section of the system, was constructed in 1885-1891, and extends from New Croton Dam to a distributing reservoir in Jerome Park, the Bronx, a distance of 23.92 miles.

Until the first Croton water was brought into the city in 1842, New York had no general water supply system, its population of about 300,000 drawing water from shallow wells or from private water companies.

Marking the centennial will be a special display at the Museum of the City of New York system through the years tracing the history of the development of the city's water supply.

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Utah tightens road fund spending policies

Governor Herbert B. Maw of Utah recently tightened controls on the state road fund by ordering that all revenues shall go first to a road construction reserve, from which he will make allocations to the road commission as needed.

Before money is allocated from the construction reserve, the road commission must submit estimates of needs in advance to the Governor for approval. This provision will apply to new construction, betterment, maintenance and beautification projects.

U. S. Signal Corps photo

Build engineer strength for army

Entrusted with the task of converting civilian engineer and construction men into expert military engineers is Brig. Gen. John W. N. Schulz (center, above), commander of the Engineer Organization Center at Camp Claiborne, La. With the two members of his staff shown shown above, Col. M. G. Martling, left, executive officer, and Capt. G. D. Tarbox, right, aide-de-camp, General Schulz heads an organization that takes thousands of men from civilian ranks and molds them into engineer war construction troops. Such troops include general service regiments, railway battalions, dump truck companies, heeavy shop companies, and other special engineer units.

In view of the fact that such units include officers and enlisted men of wide construction experience, little stress is paid to the teaching of the engineer subjects normally learned in civilian fields. However, certain subjects peculiarly military are taught and supervised by experienced officers. Men are taught principles of camouflage, construction of tank obstacles and road blocks, demolition of bridges, roads, railroads and buildings; railroad construction, road construction and construction of temporary and pontoon bridges of all types.

Chicago's State Street emerges from subway debris

To the relief of long-harassed storekeepers and shoppers, Chicago's State St. is being repaved, after having been torn up for many months by subway construction. The "before and after" views above show the vast change wrought in the city's main shopping thoroughfare.

The view at left, looking south from Lake St., shows the street condition as it has become familiar to Chicagoans, while the picture at right shows the thoroughfare with a clean face of asphalt paving. State St. paving is due to be completed in October; that on neighboring Dearborn St. by Christmas. Subway operation on the State St. road is expected by next March.

The subway tunnels under both Dearborn and State St. through the Loop were driven by shields (ENR Jan. 31, 1941, p. 30), and except for minor settlement, the tunneling did not disturb the street surface or traffic. However, in January, 1941, upon completion of tunneling, work started on construction of stations in open cut (ENR May 21, 1942, p. 74). During the past summer restoration of street utilities has added to the confusion on the street.

Italy plans continuing Rome subway construction

Plans for construction of an underground railway in Rome, Italy, have been abandoned, but it has been announced that work on the tunnel for the subway is to continue despite the war, according to *Engineering News-Record's* correspondent at London, England.

Of the total length of the proposed railway line—over 7 miles—only two miles within the city, and one mile outside, will be underground. The remainder of the line will be an open cut, with two tunnels of a total of 550 yd. in length. For reasons of economy, even the underground sections of the line will be near the surface, at some places the tunnel roof being no more than 4 to 5 ft. below the surface. Unfavorable subsoil conditions, and the need for precautions in connection with historic buildings that might be damaged caused difficulties. Construction is to be partly in open cut, and partly by driving a heading.

It is planned that underground trains will travel at a top speed of 60 mph. on headways of two or three minutes. The entire trip, allowing for five intermediate stops, will take 13 minutes.

Germany subsidizes rebuilding

In another report reaching London from Axis sources, it was said that in order to cope with heavy damage done in air raids on German towns, the German government has been compelled to adopt emergency measures to permit municipal government officers to order reconstruction or repair work to be carried out immediately.

The cost of such work is to be borne by the government.

As an evidence of the seriousness with which the German officials look on bomb damage, it is reported that the government has made arrangements to make loans to private building firms for the construction of tenement houses to provide shelter for persons bombed out of their homes, and has made arrangements for improved pay for workmen who are kept from their work by air-raids.

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Arkansas applies sales tax to war contractors

The Arkansas State Revenue Department ruled recently that the state's new 1 percent sales tax is due on sales of materials to contractors engaged in government work on defense plants, and on street construction or repair projects.

Only sales direct to the state or federal governments are exempt from the levy. Walter Fontenot, head of the Revenue Department's sales tax section, said the question of sales tax liability of defense contractors has been the principal snag in the collection of the new tax. He said that legal decisions in Alabama and in Louisiana supported the Arkansas department's action.

Sales to contractors are sales to ultimate consumers and the contractors are therefore required to pay the tax to their vendors, the department held.

Push water and sewage treatment projects

Seeking to speed construction of additional water and sewage disposal facilities to accommodate rapidly increasing populations in industrial centers, the Federal Works Agency last week announced it was ready to proceed on three projects in the eastern part of the country.

A contract will be negotiated soon at Mobile, Ala., for construction of two projects for extensions to the city's sewer and waterworks facilities, at an estimated cost of $2,358,000. An increase of approximately $62,000—bringing a federal grant to $732,000—for the expansion of sewerage facilities at Bridgeport, Conn., had been offered to that city to expedite work on a $1,319,732 project.

The go-ahead signal for the construction of Unit No. 1 of Schenectady, N. Y.'s big water expansion project has been given to City Manager Charles A. Harrell. This war public works project calls for construction of nine gravel wells with appurtenances, including installation of pumps and other necessary equipment at a cost of about $87,000.

Contracts for construction of two concrete water reservoirs as a part of Galveston's million dollar water improvement system, has been let to the J. W. Zempter Construction Co. of Galveston on its bid of $206,106.

The only contract remaining to be awarded to complete the program will provide for an auxiliary power transmission line.

OBITUARY

Wilbur Wallace Smith, 52, civil engineer of Charlotte, N. C., died recently at Clarksville, Tenn., where he was engaged in war construction. Mr. Smith, a graduate of the University of Missouri, had been a resident of Charlotte since 1910.

Maj. Gen. Henry Jervey, U.S.A., retired, 76, died recently at Charleston, S. C. A civil engineering graduate of the University of the South, Sewanee, Tenn., General Jervey during a long career with the Corps of Engineers had been assigned to the fourth district, Mississippi River improvement; rivers and harbors on the west coast of Florida and defense work on Tampa Bay; river and harbor work in Mobile and river improvements in the Cincinnati district. He was retired in 1922 as a brigadier-general and was given the rank of major general, retired in 1930.

Pilot Officer P. J. C Savage, of the Royal Canadian Air Force, formerly a civil engineer on construction of airfields and training school buildings, has been reported missing in action in air operations overseas.

Harry B. Cassin, 58, Louisville, Ky., civil engineer died recently. Before coming to Louisville in 1934, he had been city engineer and city manager of Daytona Beach, Fla.

Lieut. John O. Huckabee, 31, Albany, Ga., engineer, has been reported killed in a motor accident while on duty as an officer in the Corps of Engineers in Great Britain.

Harold M. Oldis, 48, chief engineer for the export division of the Texas Company, died recently near his home in Pelham, N. Y.

Arthur C. Patterson, civil engineer in charge of many public construction projects near Philadelphia, Pa., died Oct. 3. He resided at Chevy Chase, Md., and at his death was associated with the Farm Securities Administration as senior engineer.

Charles H. Greiling, 75, former builder of Green Bay, Wis., died recently.

CONTRACTS AND CAPITAL

ENGINEERING CONSTRUCTION volume for the week totals $139,855,000, an increase of 78 percent over the corresponding week last year, but 31 percent lower than a week ago. Federal work more than triples that reported for the 1941 week and is responsible for the 98 percent gain in public construction. Private work, however, is 19 percent below a year ago. Compared with a week ago public work is 34 percent lower as a result of the 35 percent decline in federal construction, but the private volume is 21 percent above the preceding week's total.

The current week's construction brings 1942 volume to $7,975,782,000, an increase of 58.5 percent over the $5,034,245,000 reported for the 41-week period last year. Private work, $494,906,000, is 50 percent lower than in the period last year, but public construction, $7,480,876,000, is 85 percent higher due to the 133 percent gain in federal volume.

In the classified construction groups, gains over last week are in waterworks, industrial and commercial buildings, and earthwork and drainage. Comparisons with the 1941 week reveal increases in waterworks, commercial and public buildings, and streets and roads.

New capital for construction purposes for the week totals $510,000. This volume, entirely state and municipal bond sales, is 61 percent below the corresponding week last year.

New financing for the year to date, $9,533,078,000, is 62 percent above the $5,892,332,000 reported for the 41-week period in 1941.

CONTRACTS

(Thousands of dollars)

	Week Ending Oct. 9 1941	Oct. 1 1942	Oct. 8 1942
Federal	$ 36,453	$183,832	$120,051
State & Municipal	28,602	10,382	8,745
Total public	$ 65,055	$194,214	$128,796
Total private	13,606	9,107	11,059
TOTALS	$ 78,661	$203,321	$139,855
Cumulative 1942 (41 weeks)			$7,975,782
1941 (41 weeks)			$5,034,245

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1941 41 weeks	1942 41 weeks
NON-FEDERAL	$1,066,214	$566,180
Corp. Securities	317,398	169,889
State & Mun.	360,581	184,136
U.S H.A. loans	30,399	.....
R.E.A. loans	100,500	.....
R.F.C. loans	94,336	129,455
Fed.-Aid—Highways	163,000	82,700
FEDERAL	$4,826,118	$8,966,898
TOTAL CAPITAL	$5,892,332	$9,533,078

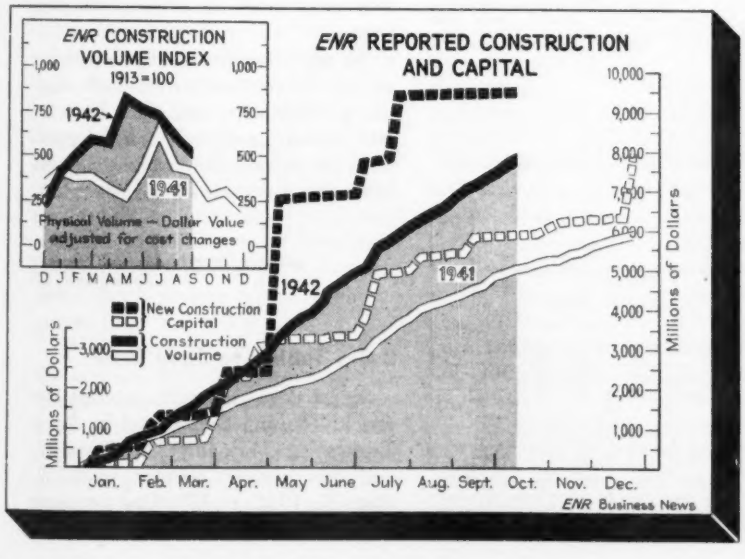
ENR INDEX NUMBERS

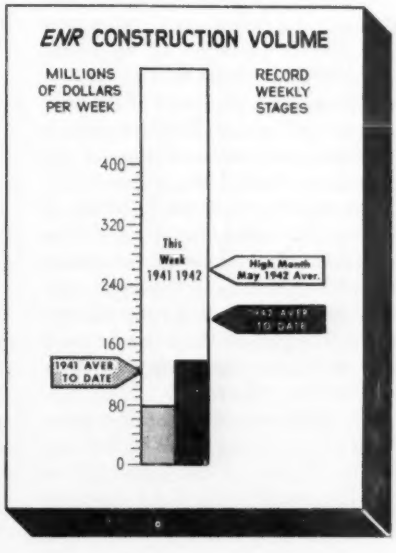
		1913	1926
Index Base = 100			
Construction Cost	Oct. '42	282.44	135.77
Building Cost	Oct. '42	225.90	122.11
Volume	Sept. '42	544	238

FHA MORTAGES

	Week Ending Oct. 4 1941	Sept. 26 1942	Oct. 3 1942
Selected for appraisal			
Title II	$22,234	$6,416	$6,032*
Title VI	$3,130	$16,158	$17,366*

* Subject to revision.


ENR CONSTRUCTION VOLUME INDEX 1913=100
1942
1941
Physical Volume — Dollar Value adjusted for cost changes
D J F M A M J J A S O N D
ENR REPORTED CONSTRUCTION AND CAPITAL
New Construction Capital
Construction Volume
Millions of Dollars
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
ENR Business News

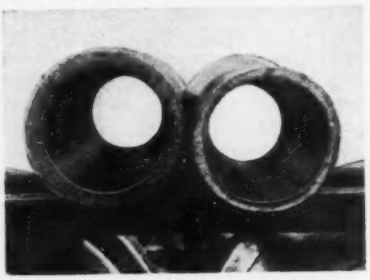

ENR CONSTRUCTION VOLUME
MILLIONS OF DOLLARS PER WEEK
RECORD WEEKLY STAGES
This Week 1941 1942
High Month May 1942 Aver.
1941 AVER TO DATE

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Extra-Strength Pipe

Sir: The accompanying photograph serves to indicate clearly the greater wall thickness of extra-strength sewer pipe now included in the revised federal specifications (*ENR*, July 2, 1942, p. 40). The ratio of thickness appears somewhat greater in this picture than the 25



percent minimum difference because the pipe illustrated is small in size (8-in.), and the manufacturer of this particular type makes it a practice to produce 8-in. extra-strength pipe even thicker than called for in the specifications.

BENJAMIN EISNER
Chief Engineer
Clay Sewer Pipe Association
Pittsburgh, Pa.

Still "Carrying On"

In answering an inquiry from W. L. Lowe-Brown, well-known consulting engineer of London, as to the source of a certain quotation in an article in Engineering News-Record, one of the editors gave the name of the publication and stated that possibly it could be found in the library of the Institution of Civil Engineers if that library had survived the bombing of London. He added that he would be interested to know how the Institution of Civil Engineers and engineers generally are carrying on during the war period. The part of Mr. Lowe-Brown's letter that covers these points is reproduced below.—EDITORS.

Sir: With regard to the last paragraph of your letter, I am glad to say that the library of the Institution of Civil Engineers is still intact and functioning normally with a reduced staff.

The Institution of Civil Engineers held regular meetings throughout the period November-May, which were well attended. In addition, several joint meetings with the mechanicals and electricals, which have been especially successful, have been held, although the average age of those present has been relatively high owing to the absence of the younger men.

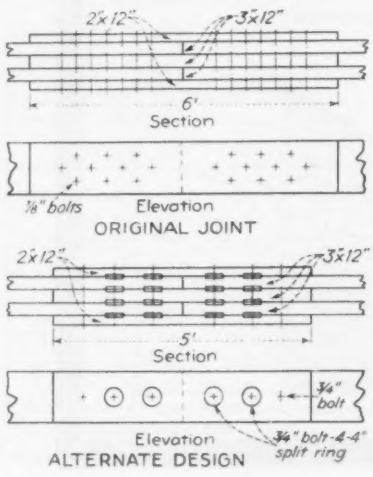
Whilst many of the larger firms of consulting engineers have transferred the bulk of their staff to offices outside London, most of them retain a skeleton establishment at their old address where the partners spend much of their time.

W. L. LOWE-BROWN
London, England

Joints Designed to Save Steel

Sir: The article "Acid Treatment Quadruples Flow in a War Plant Water Well," in *ENR* Aug. 13, 1942, p. 234, describes an interesting wood roof truss of 61-ft. span used in the shop building. It is interesting, also, to note that a subsantial saving in steel could have been made if timber connectors had been used in the joints, instead of bolts only.

As an accompanying sketch of the original and alternative splice detail shows, in the lower chord splice alone 60 percent of the weight of the metal in the bolts and washers could have been conserved for other uses. Assuming 14-in. long bolts were used in this detail, twenty ⅞-in. dia. bolts would weigh 58.6 lb., and forty 2-in. wrought-iron washers 5.1 lb., a total of 63.7 lb. The tension value of the bolted splice is 47,200 lb. A comparable splice using split rings would require six ¾-in. bolts weighing 12.2 lb., twelve ¾-in. washers weighing 1.3 lb., and sixteen 4-in. dia. split rings weighing 11.2 lb., a total of 24.7 lb. The total saving in weight is 39 lb., or more than 60 percent.



In addition to the weight saving in hardware, the possibility of serious checking of the timbers is overcome. A similar analysis of the joints between web members and chords will result in further weight savings.

ALDEN K. SMITH
Portland, Ore.

Highway Bridge Costs Wanted

Sir: During the past three years the Illinois highway department has collected one hundred complete bridge construction cost records, including daily schedules of operation for labor and equipment. These records all follow a planned set of instructions. We have compiled and evaluated many of these records for use in making estimates for a basis of award or rejection of contract.

It is proposed to compile a construction manual for use by the department as a basis of definite information on as many construction problems as can be evaluated from these records.

It has occurred to us that other highway departments might be working along the same lines and that we might cooperate in getting all available information in one construction manual.

We would be glad to furnish copies of our instructions to resident engineers which were used as a basis of our records and invite any suggestions or information which may be available. Requests should be sent to:

G. F. BURCH
Bridge Engineer
Illinois Department of Highways
Springfield, Ill.

Using Tubing to Save Steel

Sir: I have read with interest the article "Tubing Saves Steel in Long Trusses" in *ENR*, July 2, 1942, p. 37, and the comment thereon in *ENR*, Aug. 27, 1942, p. 278. One or more structures with the entire frame of

reclaimed tubing have come to my observation with all joints formed by welding. Such construction is ingenious and, at this time, the framework of structures so formed is justified by the shortage of metal and the possible savings to be effected with such construction, provided that the owners or prospective users are acquainted with the limitations that are inherent therein.

One such limitation is the weakening and final failure by corrosion on the inside of metal tubing. In plain tubing such failure in the moist climate, normal in the eastern half of the United States, will be relatively rapid and the progressive weakening from corrosion will not be easily detected.

G. G. THOMAS
Engineer of Metal Structures
Atlantic Coast Line Railroad Co.
Wilmington, N. C.

A Way to Eliminate Misplaced Manpower

Sir: I have just read your editorial in the Sept. 24 issue and the letter from the area engineer about the scarcity of skilled engineers for war work.

Due to the war activities and priority restrictions, none of the normal construction activities can be carried on by the states or by the cities. We have found that comparatively few of the engineers in subordinate positions have left the city and state engineering departments to work on government work. Instead of normal work, most of these departments apparently have started making long range plans in order to keep their engineering forces busy. We think that the basic reason for this situation is that the men working for these local government agencies have fixed family and other responsibilities and are in most cases the conservative type who are much more concerned about the permanency of their salaries than they are about the immediate extra income which could be gotten from war work.

We believe very definitely that if the city and state agencies employing engineers could be persuaded to grant a leave of absence to these men which would be in the nature of a contract providing that the agency on its part would immediately upon completion of government work give back to the employee his regular job; and, on the other hand, the employee would agree that immediately upon completion of the government work he would return to the agency, that a great number of skilled technical men would immediately become available for this war work.

This is not altogether a theory on our part, as we now have two city managers working with us on government engineering work on this kind of a setup. Perhaps the American Society of Civil Engineers, or some other similar group, could sell this idea to the various local agencies employing engineers. We merely make this suggestion because we know it has worked.

ALLEN J. SAVILLE
Slaughter, Saville & Blackburn, Inc.
Engineers
Richmond, Va.

Re Waste and Inefficiency On War Construction

One of the congressional committees investigating war construction jobs drew a critical letter from a workman who resented the implications of waste and inefficiency. The letter appeared in the Shreveport *Times*, and its writer, C. O. Bailey, is reported to have been an electrical foreman on the job. It is such a good defense of the average construction workmen and the typical construction contractor that it is reproduced below:

"Any American worker worth his salt takes a deep pride in his work. One hundred and sixty-six years of history proves that. He wholeheartedly detests waste, slipshod methods and slack effort. Especially is this true of construction men who are fundamentally builders and creators, and this applies to all of them whether they be laborers who dig foundation ditches or the superintendent who is responsible for directing the whole operation.

"No carpenter will deliberately spoil a two-by-twelve board when a one-by-four will suffice. No electrician will waste heavy wire if a smaller gage will carry the load, and neither will intentionally malinger for six hours over a job that can be done in one. Naturally there are exceptions, but these find little favor in the eyes of fellow workers, and usually last only until they can be replaced.

"Why then must charges of graft, slackerism, greed and unfitness be thrown in the teeth of those American workers who built the Louisiana Ordnance plant? They distinctly recall days and weeks of intense physical and mental effort and the endless cry while they built it for "speed, speed and more speed" from their nation at war. They remember the rain, slush and mud they worked in, the natural and man-made obstacles they continually fought against, and the feeling of frustration that at times smothered them as they climbed over endless miles of government red tape and procrastination.

"Not one of these men but what harbors a feeling of deep resentment and disgust at such criticism, especially so when such criticisom emanates from near and distant political factions whose members haven't the faintest conception of construction or its problems, who obtained their information from disgruntled employees discharged for incompetency before the job was finished, and who cannot possibly know the directing personnel who actually did the work or their reasons for doing it that particular way.

"Certainly there was some waste, most assuredly there was lost effort, unquestionably there were slackers who got by, but not one line of praise or word of commendation has appeared to say "Well Done" to the mass of sincere, conscientious workers and executives who produced one of America's most vital plants and who did it ahead of the time allotted them. No mention has been made of time lost waiting for the War Department approval of plans. No statement has indicated the daily substitution necessary for material short in this crisis.

No credit has been allowed because certain of the cogs in a hastily gathered machine failed to function. No excuses have been offered because competent construction superintendents were continually stalemated by customary government slowness. No explanation has been made why certain silly rules were promulgated to delay operations. No such action has been taken and probably won't be, nor will the many workers who started and finished the job be asked why certain things were done or not done.

"Personally I think the Silas Mason Co. and their men did a top flight job."

EDITORIALS

VOLUME 129 NUMBER 15

October 8, 1942

Meeting the Challenge

SANITARY ENGINEERS, like their colleagues in other fields of engineering, have had to cope with many new problems attributable to war. Not the least of these, of course, has had to do with the use of substitute materials. But beyond this came the challenge to design sewage treatment plants of a type for which little precedent existed. First there were the demands for facilities at Army camps. Then followed the special problem of designing treatment works for the sanitary sewage emanating from huge industrial plants; this task was complicated by a host of factors relating to flow characteristics, site locations and "shift" operations on which practically no previous experience was available. Aside from design considerations there has also been the need for development of new processes to make innocuous the industrial wastes pouring into streams, a notable example of which concerned the disposal of T.N.T. manufacturing wastes. To all of these matters the sanitary engineer has applied himself diligently and successfully, and some results from these efforts are recorded in a special section beginning on p. 81 of this issue. Progress thus far is clear indication that the challenge of wartime is being met in the field of sewage disposal practice.

Housing Paradox

AFTER being conditioned for months with repeated statements that materials for home building could be doled out only niggardly, it comes somewhat as a shock to learn that a $600,000,000 war housing program authorized by the Congress has received WPB's blessing. Without questioning the need for more housing, the fact remains that the new program would represent almost 60 percent of the total already spent in the last two years for "defense" and "war" housing requirements. And this means a colossal demand for materials, many of which have been on the critical list for some time. Yet the WPB Requirements Committee has approved an allotment of materials to carry out the program, in apparent conflict with prior WPB action in curtailing housing construction. Further inconsistency in our war housing policy appears in the statement that more than one-sixth of the money for the new program will be used to finance permanent family dwelling units costing $4,500 each. If the emergency need for houses is so dire, and the scarcity of materials is so great, what justification exists for relatively expansive "permanent" houses? It can only be hoped that these and other paradoxical questions respecting war housing will be reconciled before the proposed $600,000,000 program receives final approval.

Keeping Up the Roads

MAINTAINING ROADS under war restrictions is proving to be a major problem for most highway departments, as will be seen by the series of reports from various parts of the country beginning in this issue. Materials and equipment normally used in road work are progressively growing more difficult to obtain; men are being drawn into war industries by higher pay or are going into military service; and revenues are declining as a result of gasoline rationing. Lighter traffic might be expected to reduce the maintenance job but, while total vehicle miles are less, truck traffic, which is the kind most destructive of roads, is much heavier. Yet, despite these difficulties roads are being maintained in serviceable condition by the exercise of many ingenious expedients, which it is the purpose of this series of reports to describe.

Engineers for War Industries

CANADA has made definite plans for meeting the shortage of engineers for war industries by a program that should be given careful study on this side of the border (see p. 489). Thus, practically all engineers have been placed under the control of a central agency, and a system has been set up to facilitate shifting them into the war industries as needed. Also, to increase the number of students in engineering schools, Canada has inaugurated a plan under which top-ranking high-school students are being "channelized" into the freshman class of the engineering schools, with government assistance where that is necessary. A proposal similar to this last one was made recently by Dean Thorndike Saville of the engineering school at New York University, but unless our Selective Service practices are altered, it is difficult to see how it would be effective. Under our present system, no one of these boys could get more than six months deferment in a war job, even assuming that he would be permitted to complete his college train-

ing. Reliance for meeting industrial needs therefore must seemingly be met by shifting older engineers from non-essential jobs to war industries. To that end, this country should soon take the initial steps that already have been taken by Canada.

Rebuilding by Welding

CONSTRUCTION MEN with a welding torch have become very proficient in repairing the cracked and broken pieces of heavy equipment that are the inevitable result of war's rush tempo. Further advantages also are gained by using the same welding equipment and skills for rebuilding worn parts to a point where they are fully as useful and long-lived as the original pieces. There is a silver lining, too, in choosing a course that calls for rehabilitation over replacement. In many cases costs compare favorably, under present conditions, with the costs of new parts and, what is most significant, rehabilitation takes much less time than is required to obtain a new replacement part. Always important on construction, the welding torch, under present conditions, has become one of the most important tools in the contractor's kit.

The Present and the Future

THREE OF THE BEST SPEECHES of the year have been made in the past ten days to conventions of building trades workers. Concerned with the duties, obligations and opportunities of organized construction labor, the talks, made by high-placed government officials, contain a challenging list of suggestions that could readily be woven into a program that would constitute a veritable Magna Charta for union labor, which workers, employers and the nation at large could applaud and support. Such a program, furthermore, would aid the war effort now and give a solid basis for attack on the postwar problems that are bound to be difficult and complicated.

Consider, for example, five suggestions made by Congressman Alfred T. Beiter, who has been an outstanding proponent of advance planning for postwar public works. Mr. Beiter in a discussion of postwar construction asked the building trades workers (1) to institute apprentice training courses for the demobilized soldiers, admitting them to the union ranks instead of closing the work lanes to them; (2) to cooperate in adjusting the high war-period wage scales downward so that building will be stimulated instead of being stifled by high costs; (3) to accept new materials and construction procedures that will reduce building costs; (4) to lend support to retention of those wartime controls of standardization and simplification of sizes and forms of construction that offer possibilities for more efficient work; and (5) to do their part in establishing management-labor relations on a basis that will settle differences without strikes or lockouts.

Here is eloquent recognition of the fact that only if building costs are kept down by the use of the most efficient methods available can construction volume in the postwar period be maintained at a level that will assure employment and the advantages that go with it. Further emphasis on this point was contained in the speech by Brig. Gen. Philip B. Fleming, Federal Works Administrator, who urged acceptance of mass production methods for housing as the only means by which costs could be brought down to a level at which the workers themselves could live in the houses that they may be called upon to build.

There is, of course, one difficulty with putting such suggestions into effect. Unless we first win the war, there will not only be no postwar program of our own making, but there will be no labor unions to take part in it. Rear Admiral Ben Moreell, chief of the Navy's Bureau of Yards and Docks, in the third speech of the group, reminded the building trades workers of this unpleasant possibility in language that they both understood and applauded. There is no more excuse for a jurisdictional strike, said Admiral Moreell, than for a marine trained as a machine gunner to strike because he is asked to use a rifle or unload a landing barge. Furthermore, he added, "You fellows should not allow any private employer or any government agency through maliciousness or cupidity or stupidity, or for any other reason, to incite or provoke you into stopping work during this war." The rank and file of American labor has been waiting for such unvarnished truths from high places for a good many trying months.

These three speeches offer helpful suggestions both for the present and for the future. And both labor and management can get a lot out of them.

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Strategy and Tactics on a Wartime Waterworks Project

***Contents in Brief**—Providing adequate water for Norfolk, Newport News and Portsmouth, Va., where demands are 300 percent greater than before the war, called for development of new sources of supply, as well as construction of enlarged treatment and distribution facilities. Since the work of years had to be telescoped into a few months, and because equipment and materials were hard to get, the engineers and contractors were forced to resort to many ingenious—and some unorthodox—procedures.*

Edward J. Cleary
Managing Editor, Engineering News-Record

ENLARGING water supply facilities in the vital Hampton Roads area of Virginia is a battle of wits. The strategy and tactics of the campaign are designed to overcome water demands of unprecedented proportions, drought conditions, priorities difficulties and equipment shortages. All of which has called for unusual, if not unprecedented, practices in engineering and construction.

Making a river run backwards, for example, was not considered outside the realm of possibilities in this race against time. The desperate water shortage in Norfolk, Newport and Portsmouth, where more than a billion dollars of war work is centered, called for even more heroic measures. And when water flows freely again this fall in the shops, homes and military establishments surrounding Hampton Roads, engineers and contractors on the work will have won distinction as seasoned campaigners on the home-front.

Briefly summarized, the water situation in the Hampton Roads area is this: In 1939, peacetime demands were about 24 mgd. Defense and then war production programs followed in close succession, and as industry increased its tempo and workers flocked into the area, the demands for water mounted ever higher. At the beginning of this year consumption was over 40 mgd. and going higher every day. But the safe yield of existing sources of supply was estimated at only 43 mgd. and a drought of nearly two years duration has proved that estimate to be an optimistic one! Consequently, there was no comfort in estimates that indicated future demand would go as high as 72 mgd.—a 300 percent increase over peacetime needs.

The problem then was to develop new supply facilities in the fastest time possible. To this end the Federal Works Agency stepped into the picture and with funds supplied from Lanham Act appropriations agreed to finance a large part of the work. Meantime, test wells were drilled to determine the feasibility of groundwater development, and local ordinances were adopted to limit water use. Thus it became unlawful to use water for lawn sprinkling, car washing and for other non-essential purposes.

Where water comes from

The job of getting more water resolved itself into two major undertakings, located on opposite banks of the James River, a tidal waterway. (To serve the best interests of national security, a map has been omitted.)

Newport News, on the north side of the James, undertook the construction of a 32-mile pipeline tapping the Chickahominy River and leading to existing storage reservoirs. Some 14 miles of auxiliary transmission mains linking reservoirs and filter plants are being installed in addition to 17 miles recently completed. To provide adequate treatment a new filter plant of 6 mgd. was built adjacent to one storage reservoir and now an existing 7-mgd. capacity treatment plant is being enlarged to provide 13 mgd.

Norfolk and Portsmouth, both on the south side of the James River, and supplied from closely adjacent but independent storage lakes some distance from west of the city's limits, sought to gain additional water from the Blackwater and Nottoway rivers. This involved construction of a 19-mile pipeline discharging into existing lakes.

In addition, Norfolk is increasing the capacity of a large reservoir by construction of a dam, connecting this with Lake Prince (principal existing source), building an 18-mile transmission line from the lake to the city to supplement an existing pipeline, and enlarging its filter capacity by 12 mgd. Portsmouth is planning an additional 6-mgd. filter plant.

Given the normal amount of time (say, a couple of years), and the normal resources of material and equipment on which to draw as needed, there would have been

nothing unusual in the planning and execution of these improvements except their relative size.

But no one had any illusions about normal procedure, least of all Reeves Newsom and E. H. Aldrich, engineer-consultants on the work.

Closeted with Mr. Newsom in his field office at Williamsburg, Va., near the center of activities, the writer was introduced to a new phase of what war means to waterworks construction. In tempo with the times, as well as in fact, the term "strategy and tactics" best describes the procedure that was followed.

First, pointed out Mr. Newsom, it was imperative that water be delivered by early autumn—therefore, several years' work had to be telescoped into a period of months. Over 40 miles of pipeline and power rights-of-way were surveyed and condemned, and ten contracts were awarded in a period of 90 days.

To make certain that the objective was reached, preparations had to be made for every possible contingency that might have hindered the delivery of water at the earliest moment.

Take the Norfolk project, for example. There was no time to prepare completed plans and take bids. All construction contracts were negotiated, based upon preliminary plans and on unit prices with details of design to follow. This in itself represented a wide departure from traditional practice—but it got the job moving.

Building and installing 19 miles of 42-in. reinforced-concrete pressure pipe to tap both the Blackwater and Nottoway rivers was an impossibility in the allotted time. But it was determined that pipe could be laid for slightly less than half this distance in the time available, thus permitting water to be drawn from the Blackwater. Then, if the flow in that river was near normal, some water at least could be pumped into the Norfolk and Portsmouth reservoir lakes.

However, no reliance could be placed on the availability of adequate water in the Blackwater, particularly in view of a drought that already had lasted more than 18 months in the drainage area with at times substantially no flow in the river. To prepare for this contingency it was decided to install a temporary pipeline extending from the Nottoway River to a creek that is tributary to the Blackwater. Thus water could be diverted from a watershed of 1,400 sq.mi. into the Blackwater drainage system, which has only a 300-sq.mi. area.

Reversing the river flow

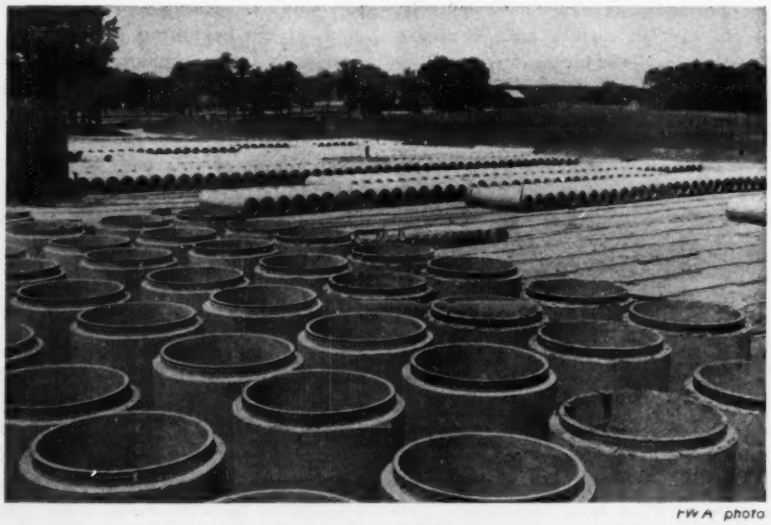
However, this creek emptied into the Blackwater some three miles downstream below the proposed intake. Therefore, in order to make the diverted water available for use the flow of the Blackwater would have to be reversed. To achieve this end, a dam—3 ft. high and 150 ft. in length—would have to be installed in the river. To prepare for this contingency, temporary piles and trestle work have been installed and steel sheet piling and other material for completing the construction of the dam is at the site.

FWA photo

Fig. 2. Pipe installation crews, like the one pictured above, are working at six places to complete the Newport News supply line.

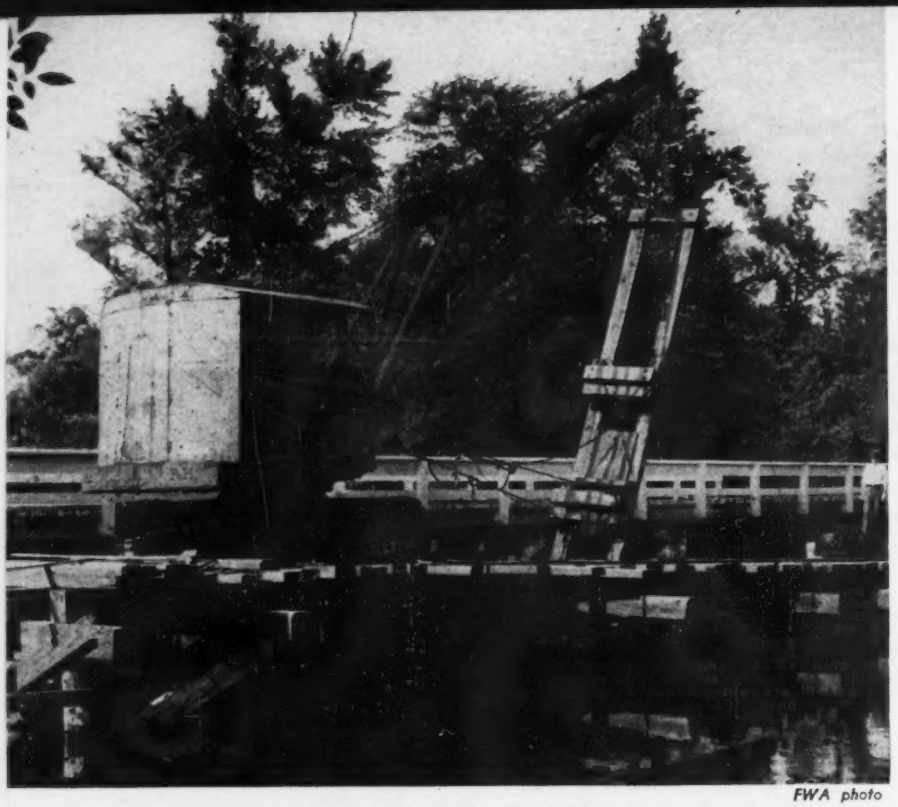
Strategically, the scheme was perfect; but tactical execution had its drawbacks. Principal obstacle was the lack of pipe to build the temporary lines from the Nottoway River to the creek. All the output from the Lock Joint Pipe Co.—even with four fabricating yards turning out record production seven days a week—was required for the permanent section of the work. Therefore, it became necessary to "borrow" 36-in. concrete pipe being cast for another line less urgently needed. This pipe was trucked some 25 miles, and laid on the ground surface ready for jointing, to serve as part of the temporary 30,000-ft. diversion line.

This scheme had its limitations, however, because only enough completed pipe to lay 20,000 ft. of the temporary line could be made in the time available. By this time the engineers had become proficient at improvisation. They simply "borrowed" again; this time it was the inner steel



FWA photo

Fig. 3. Manufacturing plant for the Chickahominy River conduit, where 100 sections of 34 and 39-in. reinforced concrete pipe (18-ft. lengths) are produced daily. One of four plants making pipe for the Hampton Roads projects this one at Ewell, Va., is believed to be the largest ever placed in operation.



FWA photo

Fig. 4. Temporary bridge to aid in the construction of a dam across the Blackwater River. This dam will reverse the flow in the river and thus bring water to the temporary pumping plant for the Norfolk supply.

cylinders for use as a reinforcing shell for concrete pipe, turned out by an expedited schedule of operations faster than completed pipe could be cast and cured. Coated both inside and out with a cement wash for temporary protection, the cylindrical steel shells will be jointed the same as would be the case with the finished concrete pipe and laid on the ground surface.

When the permanent 42-in. Nottoway line eventually is installed, the finished 36-in. pipe will be returned and the steel cylinders will be taken up and used in manufacturing the concrete pipe for which they were originally intended.

Temporary pumping plant

Thus all the strategic problems were solved so far as the pipeline installation was concerned. But without pumping facilities there was no way to get the water from either the Blackwater or Nottoway intakes into the pipeline. The permanent installation called for four 10-mgd. pumps at the Blackwater intake, and for four 11-mgd. units at the Nottoway River to be operated respectively by four 200 and four 300-hp. synchronous motors. Even with the best of priorities there was no way to get these units in operation before next year.

Again, the waterworks strategists rose to the occasion. An old two-stage turbine-driven centrifugal pump of 10-mg. capacity was found at Evansville, Ind., which no longer fitted the conditions there. By removing and separating the pumping units, cutting down the size of the impellers, and increasing the speed from 880 rpm. to 1,170 rpm., two pumps emerged capable of delivery of 17.5 and 15.0 mgd., respectively, from the Blackwater and Nottoway rivers. To drive the pumps two 400-hp. motors were picked up second hand in Florida. Temporarily installed at the intake, the two rehabilitated pump units will be ready to boost the water as soon as the pipeline work is completed. By that time the local power company will have completed ten miles of 33,000-volt transmission line and installed sufficient transformer capacity in their substation.

Assured of adequate water in late September, the city of Norfolk is rushing completion of filter plant enlargements, supplementary transmission mains and additional storage capacity in a large reservoir. This work is being supervised by Walter H. Taylor, III, veteran director of public works for the city. Not so urgently needed as the pipeline, these facilities must be completed before Norfolk's desperate water situation is ended.

Portsmouth's water trouble, also largely a matter of securing an adequate supply and additional filter capacity, will be alleviated with the completion of the temporary Nottoway-Blackwater pipeline in September. The pipeline will help to fill its depleted supply lakes, which are closely adjacent to the Norfolk storage reservoirs.

Completion of the Nottoway River water supply project will make over 50 mgd. available on the south side of the James River.

Newport News troubles

Newport News and adjacent military establishments had their first worries about water supply early in 1940. Consumption of 8 mgd. was approaching the safe yield of available sources, and plans were made for modest expansion of transmission lines, filter plant and pumping capacity.

That the federal government recognized the acute gravity of the situation in this vital area was evidenced when the Lanham Act money for public works improvements in defense areas became available in the summer of 1941. Newport News was the first city to receive a grant for a complete water project. War had not yet been declared and the first contracts, therefore, were awarded through the customary bid procedure.

With the advent of war, demands for water accelerated, reaching 10 mgd. at the beginning of this year. And with future demands estimated at 21 mgd. it became obvious that the initial expansion planned by Newport News was sorely inadequate.

In March of this year it was decided to tap the Chickahominy River, for which a 32-mile pipeline with a capacity of 19 mgd. was necessary. The designed conduit for this purpose called for 36-in. pipe.

When it came to negotiating contracts for manufacturing and installing the pipe, it was discovered that steel forms for 36-in. reinforced-concrete pipe were all in use and that it would be impossible to fabricate all the needed pipe in the few months allotted for the completion of the job. (The Office of Production Management previously had stated that cast-iron pipe in that size required too much pig iron.) However, it was

pointed out that if the design could be changed to use a combination of 34 and 39-in. sizes, steel forms were available so that concrete pipe could be delivered on a schedule to meet the deadline date for delivery of water on October 1.

Applying hydraulic legerdemain with a liberal admixture of sweat, Newsom and Alldrich hastily redesigned the conduit and pumping equipment to fit the available pipe sizes. And the Lock Joint Pipe Co. set up what is said to be the largest pipe fabrication yard ever used. Here they are producing each day 100 pieces of pipe 16 ft. long—half of 34-in. and the balance of 39-in. diameter.

Six installation gangs are at work, the first starting on June 2, each building a different section along the 32-mile pipeline. About half of the work is done, but the installation crews are faced constantly with the threat of equipment breakdowns that cannot be quickly repaired. Machines are being worked to the limit of their capacity, and despite precautions and careful maintenance there is always the likelihood that replacement parts cannot be obtained without a long delay. Purchase of new equipment, of course, is virtually impossible. Scarcity of labor in the area also interferes with progress at times.

Work is being concentrated in the first 23 miles of the Chickahominy supply line to a point where it will intersect a tributary of the first of the Newport News reservoirs. Water can be pumped to this point by the use of a part of the river station equipment which is being delivered ahead of the complete installation. This will be hooked up temporarily to get some water through the line (about 9 mgd.) at the earliest possible moment.

But the filter plant that must be used is on the second reservoir. Accordingly E. F. Dugger, general manager of the Newport News Water Commission, is laying plans to move Diesel-driven pumps from a station on the third reservoir to be used temporarily to lift water from the first reservoir to a point from where it will flow to the filter plant.

Several months ago four deep wells were sunk near the principal reservoir and have been putting 4 mgd. of water into the depleted storage system. This is high chloride water, and again there is a race against time to get the new surface source operating before the chloride content of the mixed waters gets high enough to cause trouble to industrial consumers.

Other work in the area

In addition to the major supply pipe installation other work is being pushed to complete the Newport News improvement, as mentioned earlier. This includes the construction of some 14 miles of 24, 27, 34 and 39-in. auxiliary transmission mains, the doubling of the capacity of an existing 7-mgd. water filtration plant, and construction of a 6-mgd. treatment works closer to the city. The latter now is substantially completed and will soon be carrying part of the load.

All of the work has progressed to the point where the city will get some additional water from the new supply about October 1. From then on various parts of the new system will reach completion in short order to assure an adequate, dependable supply meeting all future needs, which are expected to reach a peak in the middle of 1943.

The strategy of the plans provides for eliminating certain of the final steps in the campaign for temporary relief if rains occur in substantial amounts before the supplies are ex-

FWA photo

Fig. 5. Because of a shortage of reinforced-concrete pipe, inner steel cylinders, similar but larger than the one shown above, will be "borrowed" and laid down to serve as a temporary supply conduit. Later the cylinders will be taken up and used in manufacturing the concrete pipe for which they were originally intended.

hausted. In any event Norfolk will need auxiliary water before the permanent pumping plants can be completed so the temporary installation will go in at the Blackwater. But if by mid-September that river has a substantial flow the pipe on the surface of the ground between the first and second rivers can be left unconnected, the Nottoway emergency pumping unit actually will not be connected, and the final line of sheet piling now reposing on the bank of the Blackwater to reverse its flow will not be driven. On the other hand these parts of the work can be completed on short notice if drought conditions continue.

Likewise on the Newport News front, the coming of substantial rains will mean that the Diesel pumps will not be moved and the permanent line will be continued to the principal reservoir before pumping from the Chickahominy begins and the use of the wells can be discontinued.

Because of the anticipated completion of several large housing and camp projects in the next few weeks the exact balance between the occurrence of greatly increased demands and the availability of additional water is difficult to maintain. But the temporary reserves ready to be thrown into the front line will enable it to be done with the minimum of expense for purely temporary facilities.

Strategists and tacticians

Involved in this work and lending assistance to the engineers and managers of the local water systems have been R. W. Diggs and Rufe B. Newman, Jr., special assistants to the Federal Works Administrator who made possible the streamlined procedure in awarding contracts; L. L. Pearsall, principal engineer FWA who was delegated to the Hampton Roads area from Washington to expedite activities; Kenneth Markwell, director; and C. L. Vickers, regional engineer, of the Richmond regional office of FWA; and their staffs who processed the applications for funds and the contracts to enable the work to be prosecuted with a minimum of delay. S. W. Burns, chief, priorities division, FWA, has had the arduous task of keeping materials flowing to the projects, and Lt. Com. C. L. Pool, USNR, attached to the Naval Operating Base at Norfolk, assisted in matters pertaining to Navy requirements.

Contributing their best to this effort are the contractors on various phases of the work. In addition to The Lock Joint Pipe Co., which is furnishing the concrete pipe, these include: the Dravo Corp., Pittsburgh, and Allis-Chalmers, Milwaukee, equipment contractors; Suburban Engineering Co., New York, and Tuller Construction Co., Red Bank, N. J., who are building the pump stations and intakes; and the Bass Engineering & Construction Co., Detroit, contractors on the filter plants. Pipeline installation is being done by Price Bros., Dayton, and A. Stanley Mundy, Woodbridge, N. J.

Balanced teamwork under effective direction has been the essence of success of getting the job done in time.

Water Utility Problems Today Contrasted with Last War Period

"It is of Interest to consider the problems water departments are now experiencing, the similarity to what happened in the last war, and the difference in experience to be anticipated as this war progresses", said Reeves Newsom, consulting engineer of New York, at the recent annual conference of the American Water Works Association. The following extracts have been taken from his remarks.

One evident similarity is the time lag that occurs before rate adjustments are made reflecting the increased costs to which waterworks are put. Public utilities reports for the years 1915-1918 reveal that of a total of 98 increases granted to water companies, 4 were allowed in 1915, 12 in 1916, 15 in 1917 and 67 in the 1918 period.

Thus far in this war, no known increases have been petitioned for on the basis of increased war costs. Certainly with the history of the past few years in the adjustment of utility rates and the security which is now given such matters by regulatory bodies, at least as great if not a greater lag is to be anticipated in the present situation.

Comparison with last war

There are, of course, many elements in the present struggle that differ from those during the last war. One major change, and one which will contribute to the postponement of the time when relief is needed, is the tremendous industrial activity, which dwarfs that obtaining in the last war.

War production, because of its scope, has been spread far and wide over the country and a great many waterworks are experiencing large increases in their revenues. It is almost universally true that in communities where large industrial activity is present such revenue increases have fully offset the increased costs of operation and taxes as have been experienced up to the present time (summer of 1942).

Unionization of waterworks employees has progressed rapidly in the last two years. It was not started by the war, but has had added impetus given it by the present conditions. Whenever a group is unionized the organizer must show some benefit to the workers and this often averages as high as 15 percent in increased wages.

Sabotage safeguards costly

Anti-sabotage activities were not as highly organized in the last war as in this one. The costs for guards, flood lighting and other precautionary measures are very high in some places.

Loss of employees through the operation of the draft has caused inefficiency and resulting higher costs of operation. In those localities where extension of systems have been required and added personnel has been needed to meet the war demands in the operation of the system, waterworks manager and superintendents have had to compete for labor because of its scarcity and another increment has been added to the expenses.

The development of a solution to the problems of getting increased rates to insure proper and adequate service at a time when individuals will be carrying back-breaking taxes and in many cases facing disaster to the business and homes, is one of the major tasks facing the members of the water supply industry, concluded Mr. Newsom.

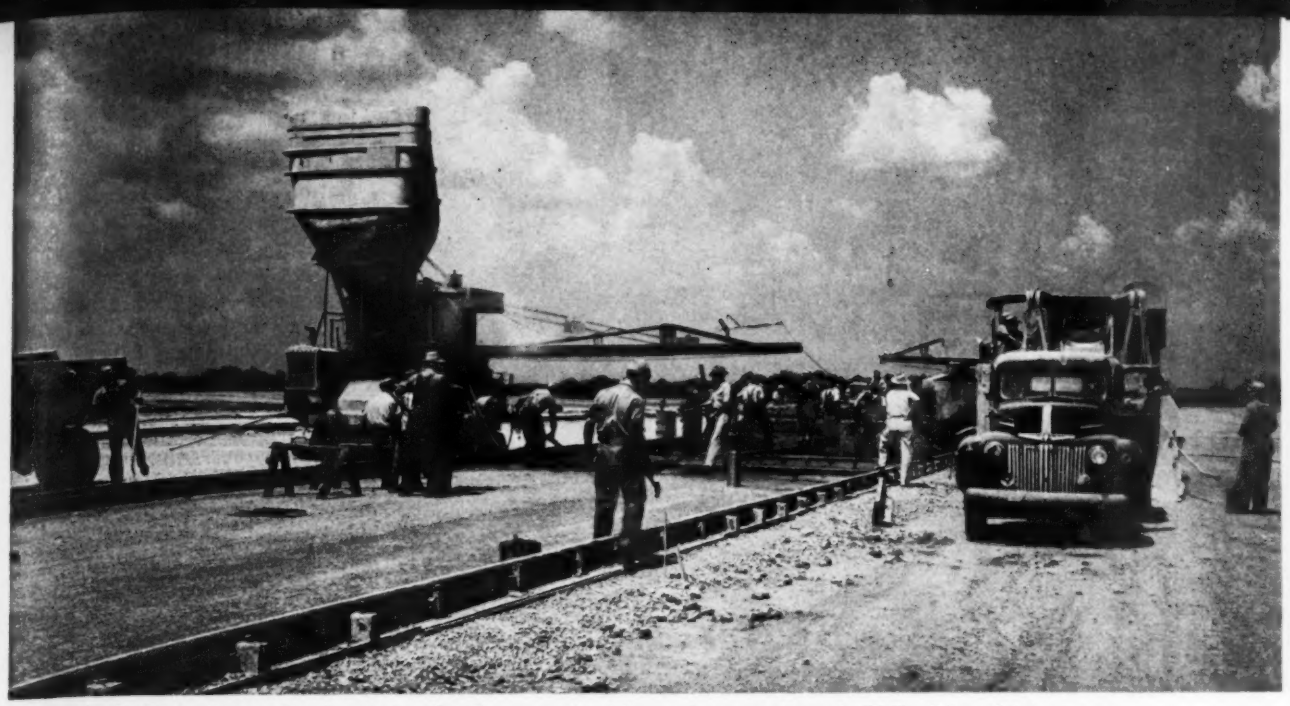


Fig. 1. General procedure in constructing the concrete slab was to pave alternate 25-ft. strips with two pavers.

Big Airbase Paved in Ninety Days

***Contents in Brief**—Biggest job in building a large airbase was construction of 604,000 sq.yd. of concrete and 330,000 sq.yd. of asphaltic pavement in 90 days. Placing of the concrete averaged 14,000 sq.yd. daily for 30 consecutive days and the maximum for any one day was 16,300 sq.yd. One of the largest collections of paving equipment ever assembled in that section of the nation was used on the job.*

IN BUILDING a 3,000-acre airbase only 90 days were allowed for construction of the 604,000 sq.yd. of concrete and 330,000 sq.yd. of asphaltic pavement required for the apron, runways and taxi strips. Knowing that it was going to be a difficult job to meet the high rate of construction required, the U. S. Engineers placed special emphasis on bringing to the job equipment that could operate simultaneously without interference. Attention was also given to the selection of key operating personnel to permit construction on two eight-hour shifts, seven days a week. As a result, one of the largest collections of paving equipment ever assembled in one place was brought together, and extremely rapid paving rates were established. The final outcome was that the paving was completed in three months, despite a loss of nearly three weeks due to bad weather.

Three 5,550-ft. runways are provided and the field is laid out for three future dual runways if ever needed. A triangular-shaped apron providing parking space for about 1,000 airplanes is also available, two legs of the triangle being 3,000 ft. long and one 3,600 ft. For two of the three completed runways, a 150-ft. wide non-reinforced-concrete central strip was used (Fig. 3). This center was built in 12½-ft. wide sections of 10-8-10-in. thickness over a 3-6-3-in. crushed rock sub-base, making the overall thickness 13 in. For 75 ft. on either side of the concrete, asphalt paving consisting of 9-in. macadam sub-base, a 3-in. binder, and a 1-in. asphalt topping was employed.

For about 1,800 ft. of the third runway a similar design was followed, but for the two ends different construction was required. For the northern end a pavement design of lime-rock asphaltic construction and consisting of a 11-in. base, a 4-in. binder, and a 1-in. topping was substituted for the 150-ft. wide concrete middle strip. For this work, as the name indicates, only crushed limestone rock was used for aggregate.

In building the remaining third of this runway the construction was altered for both the middle 150 ft. and the shoulders. For the central part an all sand-rock asphalt, consisting of an 11-in. macadam base, a 4½-in. binder, and a ½-in. topping was used. The bituminous shoulders also were different, as they were built with a macadam sub-base varying in thickness from 12 in. at the inner edge to 9 in. at the outer and with a 3½ in. binder and a 1½-in. topping. The reason for the various types of paving was to determine how the different designs stood up under similar load conditions.

For the 300-ft. wide legs of the triangular-shaped apron, a 10-7-7-10-in. non-reinforced-concrete slab over a 3-6-6-3-in. crushed rock base was used. The taxiways consist of a 100-ft. width of 10-7-7-10-in. non-reinforced-concrete and a 3-6-6-3-in. crushed rock base.

Paving work was carried out as rapidly as grading, excavation and drainage would permit. Construction of the concrete paving will be described first. The water-bound macadam sub-base for the concrete was built in two layers from stone supplied by two crushers set up on the job. These crushers prepared stone

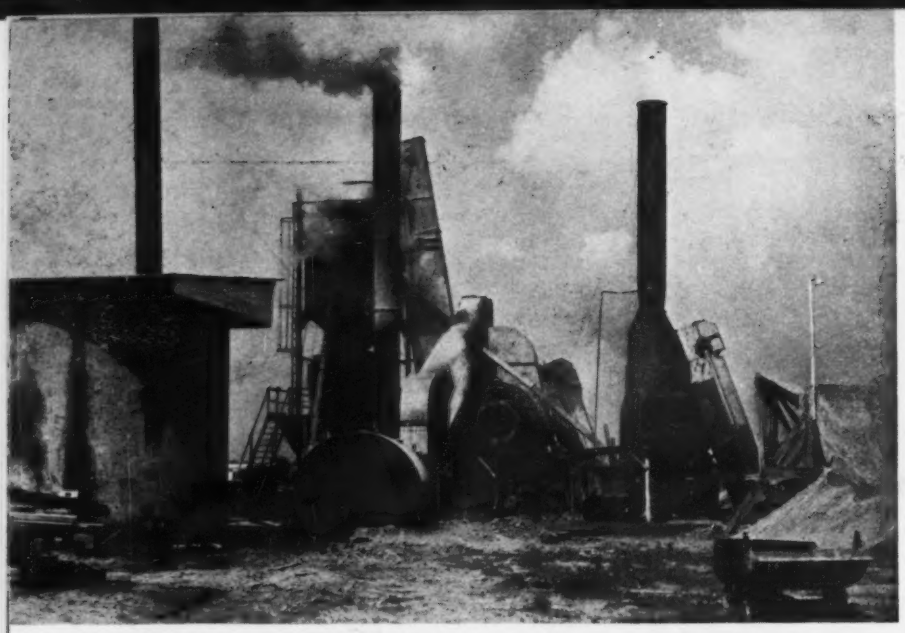


Fig. 2. Materials for the bituminous paving was prepared by this dual dryer, which had a rated capacity of 75 tons per hour but produced as much as 174 tons hourly. The dryer at the right is a 25-ft., single-shell unit added to the standard plant equipment with the 8x15-ft., double-shell dryer at the left.

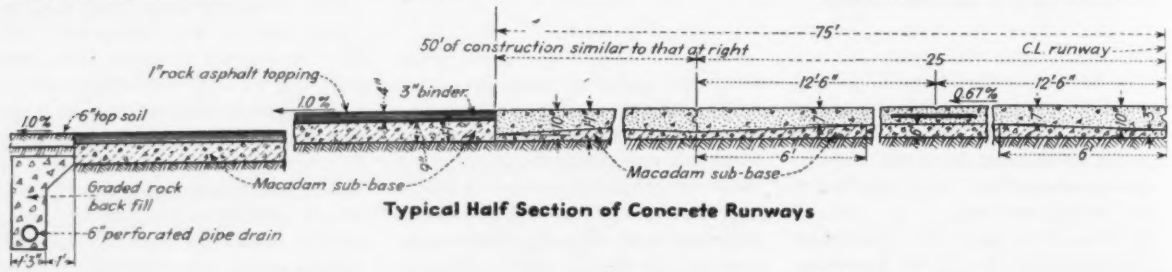
made available from the necessary rock excavation. First a 3-in. layer of crushed rock of 1½-in. maximum size was added, wetted down by three passes of the sprinkler and rolled with three-wheel smooth rollers. Next, sufficient similar rock was added to make possible the maximum 6-in. depth. After this layer had been moistened and rolled, rock dust was added to seal the base and isolate it from the concrete slab.

During early stages of the work just described speader boxes were used in placing the rock, but this proved too slow and the rock was later added by end-dump trucks dumping directly onto the base. Moistening the stone before it was dumped from the trucks prevented segregation of the rock and avoided the condition of too much large stone going to the outside of the lane being paved.

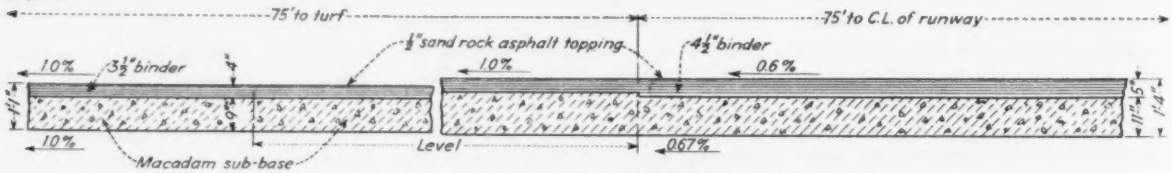
As soon as construction of the sub-base would permit, placing of the concrete started in alternate 25-ft. wide lanes for the full length of the runway, where possible. For this work the contractor used four pavers, one 34E single drum, two 34E dual drums, and one 27E single drum. In addition, two longitudinal finishers, two ribbon cutters for constructing the longitudinal and transverse joints, and 28 dual and triple-batch trucks were employed. All concrete was batched at a central plant at one edge of the site, where one bin was available for sand, one for crushed aggregate, and three for cement.

Most materials were delivered by railroad and sufficient siding was available for 18 cars of cement, 15 of sand, and 23 of aggregate. Bulk cement was transferred from the box cars to the boot of a bucket elevator by two self-powered, front-end scoops three-wheel tractors and by one 5-cu.ft. drag scraper. Aggregate and sand were unloaded by three cranes equipped with clamshell buckets. This equipment was able to unload 18 cars of cement, 18 cars of gravel and 35 of sand in two eight-hour shifts. For a short period, due to delivery tie-ups, six truck trailers were used to deliver cement in bags.

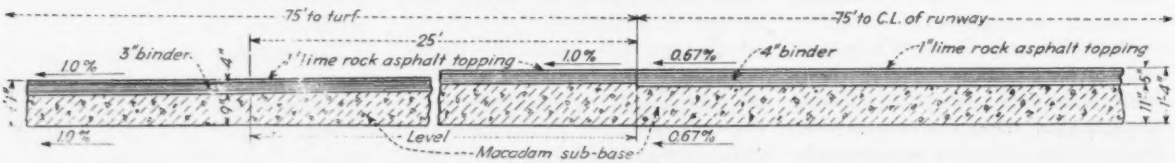
All batches were weighed by manually operated scales and eight opera-



Typical Half Section of Concrete Runways



Typical Section of All Sand-Rock Asphalt Runway



Typical Section of All Lime Rock Asphalt Runway

Fig. 3. For the greater length of the three 5,550-ft. runways the type of construction at the top was employed, but for about 1,800 ft. of one runway the middle design was used, as was the bottom design for roughly another 1,800 ft. of the same runway. Since they are to be subjected to the same loads, a comparison of the three designs will be possible.

tors were able to load a batch truck about every 45 seconds. Concrete placing started at 4 a.m. and continued until 8 p.m. Finishing of the last concrete placed was done under floodlights and often this required working until midnight.

The common procedure was to have one of the mixers operate on either side of the lane being paved, and the general practice was to pave alternate lanes. Different methods of curing were tried and one of the most successful proved to be the use of bituminous - treated, sisal - reinforced kraft paper. This material, delivered in 8-ft. wide longitudinal strips, was added soon after completion of the finishing work and was held down by 4x4-in. timbers crosswise of the pavement on about 30-ft. centers. Adding crushed stone along the edges of the paper also proved effective in preventing the paper from blowing away and exposing the concrete. Moistening of the paper was unnecessary, as it kept in sufficient moisture for proper curing. In four or five days the paper was removed; the paper could be used several times.

Dual dryer for asphalt work

Construction of the asphaltic pavement was carried out simultaneously with the concrete work. At a central plant a dual dryer set up as a 25-ft. single-shell dryer followed by an 8x15-ft. double-shell dryer was employed. The plant was unusual in that the first dryer was added to a plant that was considered standard equipment. It was rated as a 75-ton unit, but actual production from this equipment reached a maximum of 174 tons hourly.

Construction of the 9-in. sub-base required for the typical 75-ft. wide shoulders was with crushed rock of 1½-in. maximum size. This stone was placed in 3-in. layers, each layer being wetted and then rolled with smooth rollers. The most common practice was to work in an area about 2,000 ft. long and the full 75-ft. width of one shoulder. Then the binder course was added for the entire area, the material being delivered at about 275 deg. F. by 12 to 15 trucks supplying three spreaders of 12-ft. maximum width.

The rolling was done by four machines, three 7 to 12-ton tandem flat rollers and one 12-ton, three-wheel flat roller. Working two eight-hour shifts with this equipment the contractor was able to place 19,307 sq.yd. of the 3-in. thick binder course. Addition of the 1-in. topping followed soon afterward and this work was done with the same equipment. The maximum rate in adding the topping was 30,619 sq.yd. in one day with the two eight-hour shifts employed.

Construction of the pavement on the areas where lime rock was used and that where sand rock was employed was no different than the other bituminous work, except in the thicknesses of the various courses and the materials used.

Because of war restrictions the location of this project cannot be given, nor can those in charge of the job be mentioned.

Fig. 4. Using three spreaders of this type a maximum of 30,619 sq.yd. of 1-in. topping was put down in two eight-hour shifts.

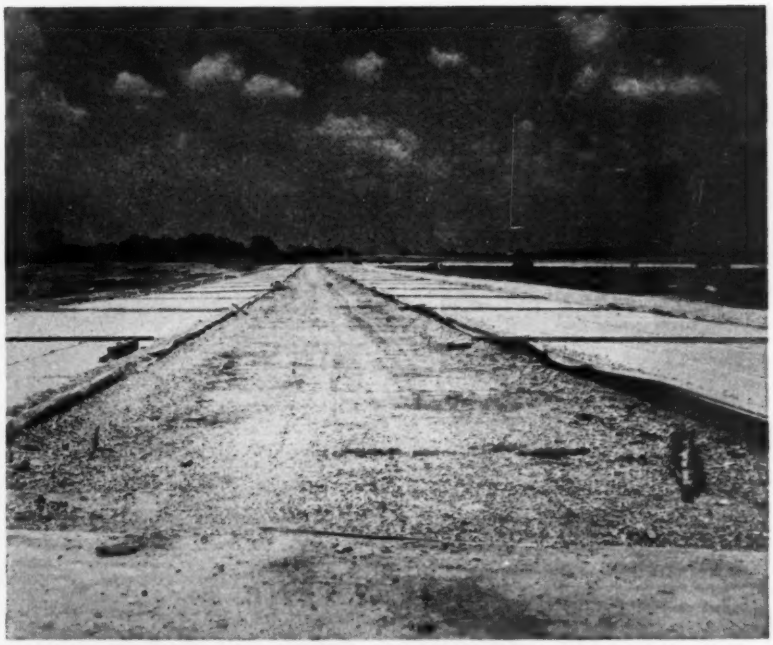


Fig. 5. Several curing methods were tried, but the most satisfactory was bituminous-treated paper placed on the slab immediately after the finishing and kept in place from four to five days. Addition of water to keep the paper moist was unnecessary. Note 4x4-in. cross timbers to hold the paper in place.

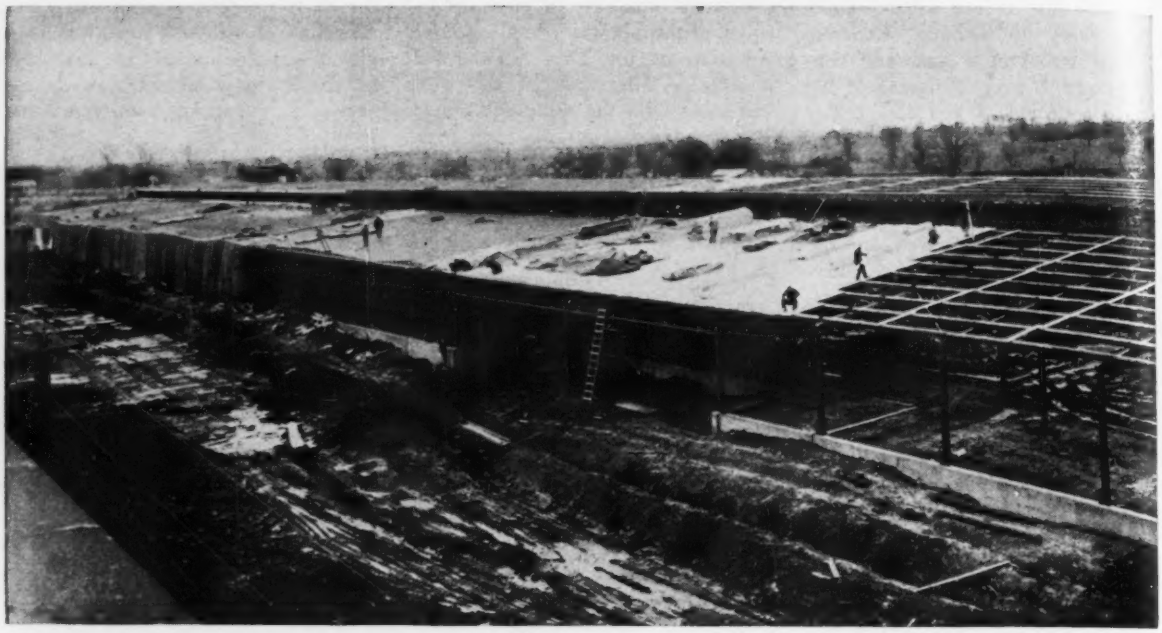


Fig. 1. Length of warehouse permitted all stages of construction, once underway, to be carried out simultaneously.

Built on Schedule and Below Estimate

***Contents in Brief**—Recently completed by the Cincinnati District, U. S. Engineers, was a 180x720-ft. steel frame warehouse that cost 8½ percent less than the engineer's estimate. No materials were on hand when the contract was awarded, but the contractor was at work four days later and within two weeks steel erection was begun.*

IN THESE DAYS of frequent delays due to priority troubles and material shortages it is not uncommon that building projects are finished many days later than originally planned. Likewise the final cost of a cost-plus-fixed-fee job may be more than the original estimate due to procurement and other troubles. It is noteworthy, therefore, that the Cincinnati District, U. S. Engineers, recently completed on schedule a 180x720-ft. steel-frame warehouse, which provides 129,600 sq.ft. of floor space, at a cost of 8½ percent below the original estimate.

The job was authorized Feb. 9, the contract awarded Feb. 25, and construction started March 1. Although at the time the work was begun no materials were on hand, steel erection started two weeks after the contractor moved on the site and no shutdowns or long delays resulted from materials not arriving as needed. Supplies were obtained under A-1-e priority.

The exterior foundation for the building consists of continuous reinforced-concrete wall about 6 ft. high; for the interior columns individual reinforced-concrete spread footings are used. To accommodate a railroad siding and a 16-ft. wide loading platform along one side, the wall had to be built to about 3 ft. above the ground level. The enclosed area was then filled with earth topped by a 6-in. layer of gravel. Over this

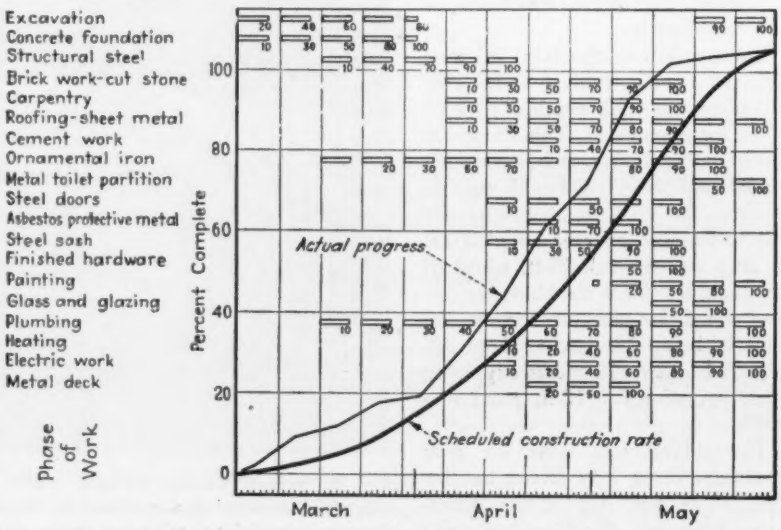


Fig. 2. Progress chart showing scheduled progress and actual advancement. The small rectangles indicate the time allowed for the different operations.

is a 6-in. reinforced-concrete slab.

Four rows of interior columns are used the long way of the building. The outside rows are on 20-ft. centers, as are the exterior columns, and the two inner rows are on a 40-ft. spacing. For the roof framing I-beams are used on the outer bays, but riveted trusses, making possible a 60-ft. wide monitor, are used for the three inner bays (Fig. 3). The roof consists of 2-in. wood sheathing covered by a 20-year, built-up tar and gravel roof. For the side walls a 13-in. thickness of brick widened to 16 in. at the columns is used. Steel-sash windows are employed and the doors are of steel construction.

Five transverse fire walls on 120-ft. centers were required. All of these are 8-in. thick, except the center one, which is made up of two 8-in. walls with a 12½-in. space between. This double wall made possible installation of a 2-in. expansion joint, the only one used in the entire length of the building.

Construction of the foundations was with ready-mix concrete and as soon as this work was complete at one end the earthfill was added. Fifteen days after work in the field started steel erection got under way and was carried out for the full width of the building as erection progressed toward the other end. Erection required the use of two crawler cranes with 50-ft. booms, and in slightly more than three weeks all of the 647 tons of structural steel had been erected. The steel and certain other materials were delivered on the railroad siding paralleling the building. Ready-mix concrete was delivered by truck-mounted mixers.

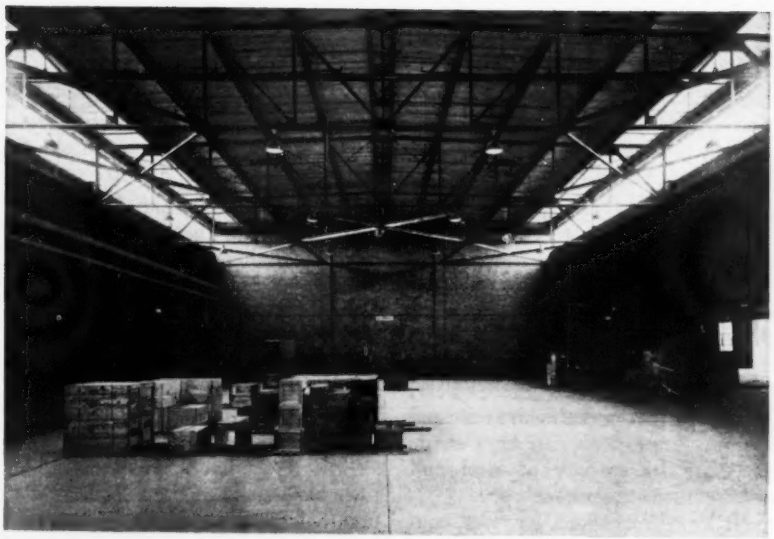


Fig. 3. Clearance provided in middle bay is 20 ft., that in the flanking bays 12⅔ ft., and the minimum in the outside bays 13 ft. Fire walls of the type shown in the foreground were required on 120-ft. centers.

As soon as possible the many other parts of the job were begun. An accompanying photograph shows how the several phases of construction were underway at the same time.

Maximum number of men employed on the job was 300 and the average was 150. For the most part only one eight-hour shift was employed, but some overtime work was necessary. The total construction cost was $406,000, 8½ percent less than the original estimate.

For the U. S. Engineers, Col. B. F. Vanderwoort is district engineer at Cincinnati. On the job Lt. Col. C. H. Menger was area engineer, Capt. Lowell G. Schweickart, assistant area engineer, and E. E. Elsey, job progress control engineer. Allied Engineers and Architects, Lexington, Ky., with John F. Wilson in charge and H. H. Catching, chief engineer, was the architect-engineer. Frank Messer & Son, Cincinnati, for whom Edward Willing was general superintendent, was the contractor.

Fig. 4. Completed structure as viewed from one corner. A 16-ft. loading platform is used on opposite side of the warehouse, where a railroad siding runs the full length of the building.

Roads Under War Restrictions—I

RESTRICTION of new highway construction to roads necessary to the defense of this country was inaugurated many months before war was declared, but it was not until early this year that the full effect of such curtailment became apparent in most highway departments. Since Pearl Harbor further curtailment of normal highway operations has been made necessary by scarcity of steel and other critical materials.

Highway operations, however, cannot be curtailed too drastically, because highways are essential to the vast war program which the nation has undertaken. New roads to serve camps and war industries must be maintained to carry soldiers, workers and supplies for the military and the civil population.

How are the state highway departments meeting the new problems that the war has brought? To answer that question editors of *Engineering News-Record* have called on the heads of highway departments across the country. The answers are so varied and so informing that it seems desirable to publish some of them in the hope that the expedients developed in some states may prove to be helpful to engineers in other states. The whole group of reports gives renewed evidence of how versatile engineers are in meeting difficult situations.

STATE WORK STRESSED IN OHIO

Ohio's 1942 road program will total as much as in most past years according to H. G. Sours, director of highways, but the distribution of expenditures among different types of roads is radically altered because of the war. About $18,000,000 of contract expenditures was scheduled at the first of the year and, by Aug. 1, $14,325,366 has been "sold." Of this, $7,904,701 was on state roads; $2,625,407 on federal-aid roads, and $3,795,258 on war access roads. In previous years the amounts for state and federal-aid roads would have been reversed, and therein rests the significant fact about Ohio's 1942 road program. It is concentrated on the state road system and is, in effect, a salvage operation, bringing many inadequate and worn-out routes up to war-use requirements.

Not only did Ohio have the need to reinforce its state roads, but fortunately it also had the money to undertake the work. As in all states, the federal government pays 75 percent of the cost of strategic net highways and usually 100 percent on access roads, a procedure which conserves the state's money. In addition, road income to the state has so far held up remarkably well. Motor vehicle licenses, renewed in April, show no reduction; in fact, out-of-state cars, whose owners have come to Ohio defense plants, have swelled the total of cars in service, and licenses for trucks are still on the increase. There is no gas rationing in Ohio, and gas tax revenues have, therefore, not dropped markedly. Measured by gallonage taxed, comparative figures by months stack 1942 against 1941 as follows: January, 108 percent; February, 97 percent; March, 95 percent; April, 90 percent, and May, 86 percent. Thus total decrease for five months in gas tax revenues is only 5.46 percent.

Main roads in fair condition

That Ohio's main roads are in fair condition is suggested by the amount of money that has been spent on them in the past three years. In 1939, for example, Ohio had a balance of federal-aid money unexpended totaling $16,000,000. At the present time this balance is reduced to less than 3½ million and nearly half of this is for grade crossing work for which no priority aid is available anyway. Now that construction on main routes has to be approved by the War Department as necessary to the war effort, jobs using federal funds are greatly reduced. So far this year Ohio has under construction only two or three strategic highway jobs totaling about 20 miles, as compared with a usual annual average of about 100 miles on the main network.

But even though Ohio's main roads which have been constructed in recent years are in first-class condition, much work remains to be done. Because centers of population are well distributed over the entire state, a rather close network of heavily traveled highways has been developed and many of these highways were constructed long before modern standards were in effect. Consequently there is still quite a large mileage on the main system of roads in Ohio that needs reconstruction and modernization.

Over a period of years the state gradually fell behind in the improvement of some of its main roads. New and modern construction replaced some of the worst mileage, but due to the fact that many of the improvements were old and subjected to heavy traffic they reached a point where a greater mileage was wearing out faster than could be replaced. After federal aid had been matched and right-of-way purchased, the funds were not sufficient to carry on the needed widening and resurfacing of the remaining trunk-line roads, nor could as much be done as was necessary on the secondary roads. This year, not having the opportunity to use its funds for matching, the state decided to catch up on its secondary system and in January set up a 7 million dollar salvaging and resurfacing program.

Pavements which are 16 and 18 ft. wide on main highways are being widened to 20 or 22 ft., with either bituminous concrete or in some cases water-bound macadam, and then are being resurfaced full width with approximately 2½ in. of bituminous concrete. In some cases where the old pavement is quite weak the surface has been stepped up some 3 to 4 in. Many of the 18- and 20-ft. pavements are being resurfaced only, no widening being done. Under normal conditions such pavements would be widened to 22 ft. and in some cases to

24 ft. With the reduced speeds in effect now, however, much of the danger of the narrow pavement has been removed. It is considered more important to surface additional mileage and leave the widening of 18- and 20-ft. pavements for future consideration. This is not true in all cases as some of these narrow pavements are being widened where traffic is extremely heavy.

All of this work, which is being done by contract, is in addition to the normal force-account maintenance work which totals upwards of $15,000,000.

Damage done by heavy trucks

The war has also had its effect on this part of the highway department's job, heavy industrial trucking breaking up the pavements in an alarming manner and restrictions on asphalts and tar making patching more difficult. Bad spots on concrete pavements have been resurfaced with as much as 4 in. of bituminous concrete to spread loads and absorb impacts. On rough brick roads, the usual procedure is to seal them with an emulsion and then sand them heavily. Much new metal has also been added to gravel roads.

Meeting asphalt shortages

A good deal of thought has been given to the question of what to do if tar and asphalt become unavailable. Secondary roads can of course be built and maintained with water-bound macadam, calcium chloride, or by special mixtures of bank-run gravel and clay. Concrete roads can be repaired with cement patches, and brick roads can be relaid instead of resurfaced. None of these expedients will be as satisfactory as treatment with tar or asphalt, but they will keep the roads in service.

The maintenance division has recently hired a tire expert who travels the state giving instructions to the maintenance crews and seeing that rules against overloading are not being violated. Each division also holds a meeting of its superintendents once a month to discuss all sorts of maintenance problems.

Bridge materials scarce

In the bridge field, materials priorities are the serious problem. Ohio had developed a very economical design of continuous steel beams with concrete decks, which fitted most of the streams that had to be crossed. With the restrictions on steel, the department turned to continuous concrete beam bridges without greatly altering the necessary span arrangement. Near the Berlin reservoir, for example, a continuous concrete girder bridge is being designed whose spans are 84-120-120-82-ft. Even the rolled girder bridges of pre-war days would not be built longer than 120 ft. span.

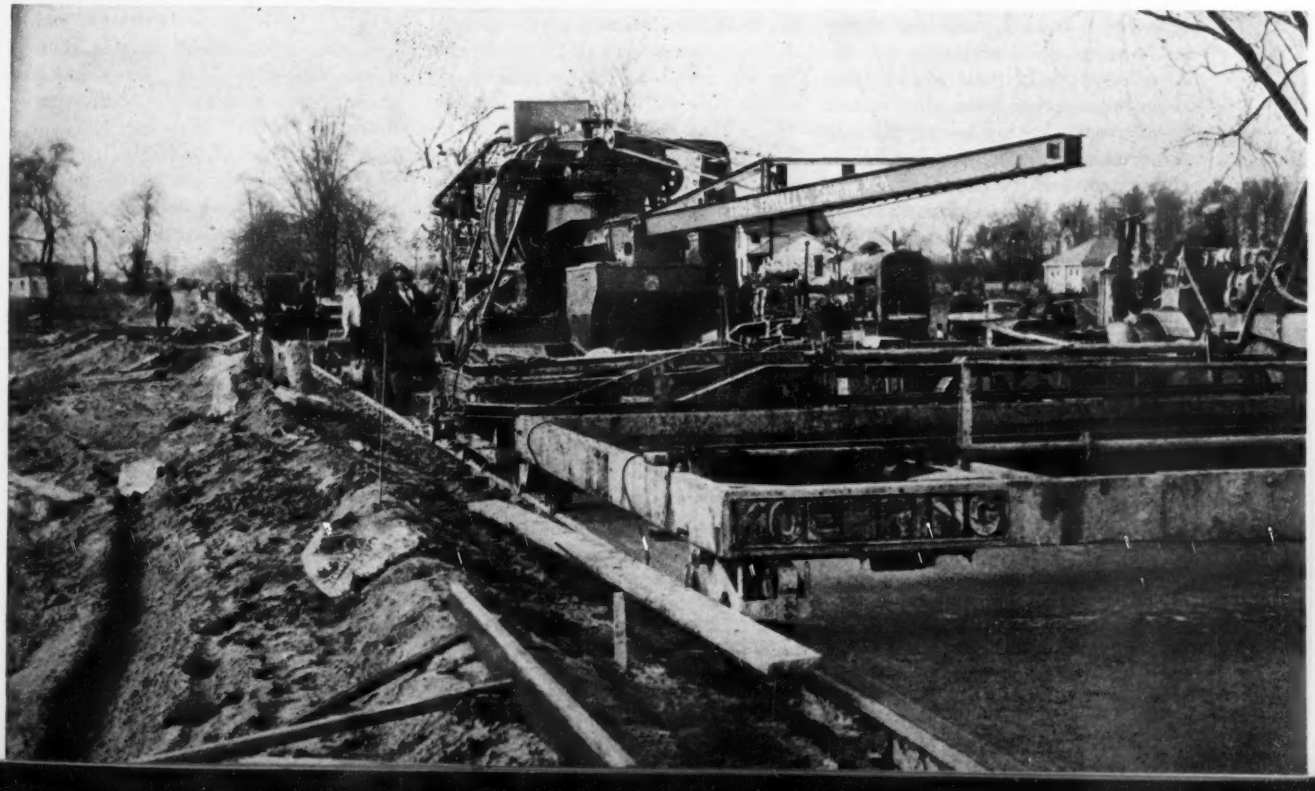
But with reinforcing bars becoming tighter, the department is now trying timber. However, since timbers deeper than 12 in. are scarce, timber designs cannot go much beyond a 20-ft. span. Trusses have been considered, but for main highway bridges, the same problem of shallow depth timbers is met again in providing the long floor-beams. The department has used a good many laminated timber floors fastened together with driven dowels. One problem has been that of transferring shear between the various laminations. According to calculations, nails cannot effect this transfer completely. Although shear connector dowels have been investigated, none has yet been used.

Specifications modified

In order to assure bids on its construction work, the Ohio highway department has inserted several emergency clauses in its specifications. One states that "should there be an increase in freight rates, the state will, in addition to the compensation otherwise agreed upon, pay the contractor the cost to him of such increase." This applies only to materials and not to tools or equipment.

Another paragraph states that "When it is the finding of the director of highways that materials necessary to carry out the contract and complete the construction are not available to the contractor within a reasonable length of time because of any law, rule or regulation of the government of the United States in effect by virtue of the state of war now existing, including those relating to priorities, the director of highways will

Outstanding among the effects of war restrictions on highway work is widespread use of unreinforced-concrete pavement.



relieve the contractor from performing such part of the contract as according to his findings cannot be performed due to the inability to obtain such materials."

A further requirement protects the contractor against delays due to unforeseen causes beyond the control and without the fault or negligence of the contractor, including acts of God, acts of the public enemy, acts of the government, acts of the state or any political subdivision thereof, fires, floods, epidemics, etc.

The Ohio highway department has lost about 2,000 of its 7,500 employees as a result of the war. Of this 2,000, slightly over 500 have gone into the armed services, the remainder into war plants. About a third of these were probably engineers. Maintenance forces were particularly hard hit by men going into war work where higher wages were available. Employees going into the armed services are, of course, granted leaves of absence for the duration of the war, plus six months. Some leaves of absence were granted to others, but these have usually been on a temporary basis. Employees have also been loaned to war agencies for short periods.

MICHIGAN'S PROBLEM IS TRAFFIC

Michigan's main highway problem is a traffic problem, that of providing adequate road capacity for the tens of thousands of workers who travel by car to and from the great plants of the many war industries of the state, especially the great new Ford plant at Willow Run. A secondary problem, states G. Donald Kennedy, state highway commissioner, is that of maintaining in serviceable condition the old concrete pavements that are rapidly going to pieces under the pounding of war traffic.

Old concrete pavements

A year ago last spring, the state had a high rate of failures in black top pavement; this past spring the same epidemic hit the old concrete pavements, due possibly to a very wet fall, but certainly aggravated by the increase in trucking and the higher loads on trucks serving the war industries. Many of these old concrete pavements have been in service twenty years, having been built with proceeds of a $50,000,000 bond issue authorized in 1920. The current highway program includes about $2,000,000 for repairing and recapping these pavements with 2-in. bituminous concrete. Loose sections of concrete are cut out and repaired with concrete. All expansion cracks are filled with bituminous material and then the resurfacing is applied in two layers. This work is done by contract. The current program will be completed this year, but more is necessary and the amount let to contract will depend on the highway department's income during the latter part of this year.

Income from the weight tax goes to the counties as does part of the gas tax. Last year the amount turned over to the counties was roughly $6,550,000, leaving $29,500,000 for highway department work. That was an all-time high. A sharp decline is in prospect for this year, especially in the gas tax. Weight tax payments made recently by the highway department to the counties for the second quarter of the year totaled about $1,392,500 as against $2,525,373 for the same period last year.

New construction

Unlike many states, Michigan has had to step up its construction program this year to provide access roads to war industries and to save its old roads from destruction by war-generated traffic. Major items are the access roads to the Ford bomber plant and the section of the Detroit Industrial Expressway that will give three access roads better connections to the River Rouge plant and to Detroit. That highway will cost nearly $12,000,000.

Bids on new work are few in number and bid prices are substantially above the engineers' estimates.

Critical materials

Lack of steel for highway structures is a major problem. Completion of one of the main roads to the Willow Run plant is being held up by inability to get steel for a railway overpass. Steel girders were specified there to carry the railway because of the long spans required. Steel girders for the other grade separation structures were ordered before conditions became so critical. Steel for reinforcing now is becoming more difficult to obtain but the department expects to be able to get material for the grade separation structures on the Detroit Industrial Expressway, which has all crossings separated.

Concrete pavements for the access roads and the expressway are unreinforced, a uniform 9-in. section in place of the 10-8-10-in. reinforced section that would be used normally for such work. The unreinforced pavement has no dowel bars along the center joint, these joints being keyed, and no load-transfer bars at the expansion joints. Expansion joints have asphalt-impregnated fiber fillers 1-in. thick, set low and capped with bituminous mastic. These joints are spaced 120 ft. apart, and there are planes of weakness at 20-ft. intervals created by insertion of a thin bituminous felt filler in the upper two inches of the pavement.

Culverts of unreinforced-concrete pipe or of extra-strength clay tile pipe are used when reinforced-concrete pipe is unobtainable.

On work other than access roads, the highway department is using timber for bridges wherever possible. This is exemplified in a contract recently let for a seven-span timber bridge over Rifle River in Ogemaw County where a reinforced-concrete structure had been planned. A change to timber saved 55 tons of reinforcing steel and cut the cost by nearly $8,000 on a structure estimated to cost around $30,000.

Timber bridge work

Timber bridges for this emergency program have composite timber and concrete decks carried on pile abutments and piers, all timber being creosoted. The decks are of the type described in *ENR*, Feb. 12, 1942, p. 282, a sub-floor of laminated timber, alternate rows being elevated, and a wearing surface of concrete. Decks for the first bridges of this type to be used in Michigan were designed as simple beams without reinforcing steel, but on the recommendations of the Public Roads Administration, reinforcing has been added in more recent designs. The relatively small amount of reinforcing steel required is supplied to the contractors by the state highway department from its reserve stock whenever possible.

Other than reinforcing steel, the only metal in these bridges is in the shear developers in the composite

decks and the bolts, drift pins and washers for the timber work. Shear developers were bought some time before steel became critical for a pier that the highway department then expected to build at the Straits of Mackinac. These shear developers are supplied to contractors for the timber bridges now being built. As to other hardware, the specifications state that "Used hardware will be accepted." Contractors have displayed much ingenuity in getting the hardware, some going to junk yards to buy up old rods which can be cut and made into bolts and drift pins.

Some lumber scarce

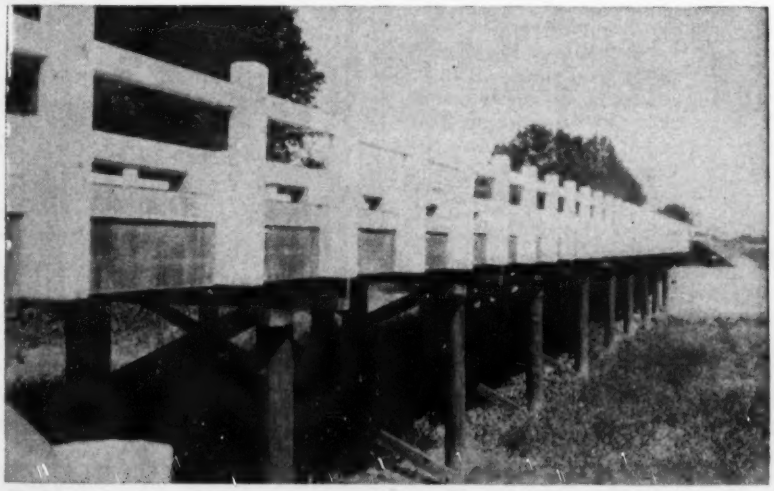
Some grades of timber are no longer available locally, such as No. 1 fir in 22-ft. lengths normally specified for the type of timber bridges the state is using. No. 2 grade is still available, and some of the No. 1 grade can be obtained in shorter lengths. These conditions were recognized in writing the specifications for bridges recently put up for bids.

Maintenance work

Maintenance is going forward at a fairly normal rate, but plans are being made to curtail it if and when highway income falls off. To that end, the department has designated certain roads as forming a basic network to serve war industries. Maintenance of these roads will be continued at from 90 to 100 percent of normal; roads not on the basic system will get from 50 to 75 percent of normal maintenance.

Maintenance will be centered on preservation of investment; grass cutting, trimming banks and like improvement work will not be done.

Men are being lost right and left to war industries and to military service. William H. Harvie, road engineer, and Olaf Stokstad, head of the soil section of the research and testing division, were the latest losses to the armed forces. Much of the airport work of the Corps of Engineers in Michigan is being done by former members of the state highway department staff. In all, the department had 225 men in service on August 15.



Timber bridges are being used extensively on new work to conserve critical materials. The timber is treated to increase its life.

LITTLE EFFECT YET IN WISCONSIN

Wisconsin's highway commission staff has not been as seriously affected by the shift over a war economy as have some states, according to E. L. Roettiger, state highway engineer, due to the fact that the commission's staff is not as large as the highway staffs in many of the states. The Wisconsin commission does not directly employ the personnel for operations under the maintenance department; all state trunk highway maintenance is done by the counties on a modified contract basis under authorization and supervision of a small staff of the central office and by nine division offices of the commission. Also, these division offices make all surveys and plans for new highway construction.

Wisconsin started a new fiscal year in July. All its work on the state and federal system and most of the county work is financed from gasoline taxes and motor vehicle revenues. These have totaled between 33 and 34 million in recent years, all the monies going into the general state fund from which they are disbursed by the legislature under budgetary control. About $24,000,000 of the gas tax and motor vehicle revenue is allocated to the counties or to other purposes by statutory enactment; the remainder is allocated to the highway commission for financing maintenance of the state trunk highway system and for improvement work. So far, there has been no substantial decline in income, but there are indications that the latter months of the new fiscal year will see a pronounced drop. And as the county allocations are fixed by statute, any decline is absorbed by the state commission. Because the commission has already curtailed its new work drastically, this may not be serious. However, in the dark days of the Thirties, the gasoline tax and motor vehicle revenue fell so low that there was not enough to cover all the statutory allocations to the counties and still provide for essential maintenance on the state system, making legislative action necessary to provide funds for the commission to carry on.

Current construction

Most of the work put under way before war was declared is now completed or nearing completion. Between five and six million dollars was carried over from last year. The commission's engineers are not pushing contractors to complete unfinished work, knowing the difficulties they are working under. Also, where the work is on a new location requiring other sections to be built before the road goes into service, or is on a section where bridges that cannot now be completed for lack of steel are essential to use of the road, there is little point in pressing for early completion.

New construction on access roads or approved sections of the strategic highway network totals only $1,500,000 as against $2,500,000 of new concrete pavement or $10,000,000 total construction in a normal year.

Concrete pavement costs are up 40 to 45 percent. For example, Mr. Roettiger said that a recent bid on a superstructure job—pavement, shoulders, etc.—on a continuation of a job done last year, was $29,000 per mile

as against about $20,000 for similar work let to contract last year. The department still gets bids on its new letting but there is little competition as most contractors can get war jobs if they want them.

Bituminous work

Bituminous construction in the state system had been quite drastically curtailed before the Public Roads Administration extended the zone in which restrictions on the use of bituminous oils is necessary. Normally, 12,000,000 gal. is used for state highway maintenance and betterment work; this year the amount is down to about 3,500,000 gal., largely cut-back asphalt and tars. Part of this curtailment was due to the failure of the state to contract satisfactorily for the road oils usually used.

Fortunately, the spring breakup was unusually light this year. Had it been bad, the limited supply of oils would not have been enough to meet repair requirements. No major bituminous operations can be undertaken.

Maintenance

Maintenance work, as previously noted, is under the counties. In the past, much betterment work has been done as maintenance. That work will be curtailed in the fiscal year just starting, due largely to restrictions on the use of bituminous materials. Mr. Roettiger looks for a decline in maintenance operations unless the curtailment of new work is of long duration.

Substitute materials

Wisconsin is cutting out the use of critical materials as completely as possible. It has even substituted timber for iron in gratings for catch-basins in some instances.

In concrete paving, an unreinforced slab of 10-7-10:10-7-10-in. (two 11-ft. lanes) is being substituted for the state's former 9-6½-9-in. reinforced slab. No dowels are used across the thickened-edge center and transverse joints. Expansion joints are of fiber or wood, spaced 120 ft. and construction joints at 20-ft. intervals.

For smaller bridges the state in the past has made extensive use of treated timber bents and abutments carrying steel stringers and a concrete deck in single or multiple spans of about 30 ft. Now, timber stringers are used and timber decks, span lengths being decreased to permit this use of timber in place of steel.

No metal culverts are used and no reinforced-concrete arches or boxes. Contractors are permitted to make whatever substitutions seem most advantageous. Some reinforced-concrete pipe can still be bought. Where load concentrations are not high, unreinforced concrete or clay tile pipe is used; where loads are high these pipes are encased in concrete, generally in concrete blocks having rectangular bases and tops arched over the pipe. Where larger openings are required, unreinforced arch culverts or box culverts with arched tops are used.

Losses due to men entering military service or going to work in war industries, as well as those due to lay-offs resulting from curtailment of new work, have cut the commission's forces from 680 to about 400. Wherever possible, the regular employees are being retained for supervision of maintenance, office work and postwar planning.

Postwar planning

No extensive postwar planning has been done by the Wisconsin Highway Commission, chiefly because the state operates on an annual budget basis. The commission, however, had been able to do a small amount of long-range planning for future work before expenditure of a percentage of federal-aid funds on postwar planning was authorized. Now it expects to be able to do more of this work using men released from construction.

The commission is fortunate in being able to work in close cooperation with the State Planning Board. That board gets its support from highway commission funds and its director of regional planning, M. W. Torkelson, served with the highway department for many years and so is familiar with the state's needs in the way of roads.

Reports on the effect of war conditions on the operations of other highway departments will be published in a subsequent issue.

Highway departments are having to continue maintenance operations to prevent loss of investment in new roads.

Mobilizing Canada's Technical Manpower

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***Contents in Brief**—All of Canada's engineers and scientists have been carefully cataloged by the Wartime Bureau of Technical Personnel, and all changes in employment in stated categories of engineering or scientific work must now clear through that agency. In the universities the work of engineering and science students now is centered on fitting them into war industries or branches of the armed forces where they can be of greatest value on completion of their training. Selected high school students are being advanced to college study with public aid where necessary.*

COMPLETE MOBILIZATION of all technical and scientific personnel in Canada is enabling the Dominion Government to direct the efforts of engineers and scientists as an integral part of the country's war effort. This mobilization is the work of the Wartime Bureau of Technical Personnel, an emergency body founded a little more than a year ago by common action of the Canadian engineering and scientific societies. Now working directly under the Ministry of Labour, the bureau has a detailed record of nearly 25,000 engineers and scientists. It is maintaining a running inventory of this highly skilled manpower and, with the aid of five strategically located regional offices, demands of wartime industries for scientific and technical personnel are being dealt with by the bureau, insofar as the corresponding requirements of the armed forces make that possible.

Joint action by the societies

As early as December, 1938, the Minister of Defense requested the three leading technical societies of Canada to undertake a survey of their membership in relation to wartime needs of industry, the government and the armed forces. The three societies involved were the Engineering Institute of Canada, the Canadian Institute of Mining and Metallurgy, and the Canadian Institute of Chemistry. A survey was made and the completed file passed over to the government jointly by the three societies.

The incidence of war intensified the need for the information thus assembled, and introduced many new and complicated factors into the manpower picture. Following a series of meetings between government representatives and representatives of the three societies, there came a formal request from the Minister of Labour for the cooperation of the societies in setting up the Wartime Bureau of Technical Personnel.

Organization of the bureau

The bureau was organized in 1941. Choice of a director was left to the societies, and they were able to secure the part time services of Elliot M. Little, an electrical engineer, general manager of one of the country's largest paper companies. An advisory board also was set up consisting of one representative from the interested societies, the Canadian Manufacturers Association, the universities of Canada and the provincial associations of professional engineers. L. Austin Wright, general secretary of the Engineering Institute of Canada, was named assistant director, the institute agreeing to his part-time service with the bureau.

Employment Controlled

Engineers and scientists in Canada may now be asked by the Wartime Bureau of Technical Personnel to leave their present positions to take up essential war work and employers must release them except under unusual circumstances. Technical personnel must notify the bureau when they leave a job and may not be employed on other work without a certificate from the bureau.

The first major task undertaken by the bureau was a census of all Canada's engineers, architects, chemists and other scientific and technical workers in industry. Membership lists of appropriate organizations, together with the records available through the national registration of 1940, were used as a basis for the mailing of questionnaire cards. Fifty-five thousand such cards have been distributed to date. Within a short time after sending out the first batch of questionnaires, some 14,000 registrations were received; since then the total registration has increased to over 24,000 and replys are still coming.

The scope of the bureau's work was widened in September, 1941, when the register was extended to cover research and scientific workers throughout Canada. To date, 1,325 research scientists are registered with the bureau.

Pioneer manpower study

The work described was the first concerted effort in Canada to deal with any of the special problems of manpower created by the war, and particularly the problem caused by the great increase in industrial activity of all kinds, paralleling a corresponding increase in the armed forces of the Dominion. That this pioneer work was successful was demonstrated when the director of the bureau, E. M. Little, was appointed director of National Selective Service for Canada when the federal government instituted its general scheme of manpower control in March, 1942.

L. Austin Wright accompanied Mr. Little to his new office as assistant director. H. W. Lea, previously chief executive officer, who is on loan to the bureau from Canadian Telephones and Supplies, was appointed director of the bureau.

Work of the bureau has expanded so much that regional offices have

been opened at Halifax, Montreal, Toronto, Hamilton and Vancouver, each headed by a well-known local engineer on leave from his usual peacetime employment.

Keynote of the work of the bureau has been "finding men for jobs" instead of the more usual employment procedure of finding jobs for men. Inquiries from industry are directed to the bureau which endeavors to fill the requirements by reference to its files of personnel data. Government departments and the armed forces are assisted similarly, and even a request from Great Britain for a group of engineers trained in one special field was handled with success. An appreciable number of Polish engineers and skilled artisans who had escaped from Europe were examined through the services of the bureau and placed in suitable employment in Canadian industries.

Complete control set up

All this work was on a voluntary basis until March 23, 1942, when the federal government, through an order-in-council, gave the bureau, under authority of the Minister of Labour, complete control over all technical personnel in Canada. Any person in the categories scheduled in the order may now be requested to leave his present position to undertake essential war work; employers must release such persons unless their objections are accepted by the Minister of Labour. Technical personnel leaving positions must notify the director of the bureau, as also must their employers. Before they take up new positions, the prospective employer must receive a permit from the bureau approving the new contract of employment. Imposition of penalties (fines up to $500) is authorized for noncompliance with the regulations set up under the order-in-council.

The order has served to intensify the pressure of work upon the bureau, yet at the same time it facilitates some aspects of the bureau's work by giving the director added power. The bureau still operates largely by consultation and personal interviews, requiring employers in all cases to study their existing staff before engaging new personnel to see whether some of their own engineers cannot be diverted from other work to the more essential work in view. Considerable success has attended such efforts.

Throughout its work the bureau has maintained very close contact with the engineering and science faculties of all Canadian universities. Representatives of the bureau visit the colleges and interview the staffs and students. The bureau was instrumental last spring in having arrangements made for the release of engineering and science students from compulsory summer military training camps, provided they were engaged on essential war work; and by making direct contact with 1,500 industrial and engineering offices across the country the bureau was able to cooperate very satisfactorily with university authorities in arranging for wartime experience for students during the summer vacation. It is believed that practically all Canadian engineering students were thus engaged on essential work of one type or another during the summer.

Persons to Whom The Regulations Apply

All professional engineers.

Production, industrial or other engineers or scientists who have to do with any phase of executive management or technical control.

All teachers of engineering and science at universities and technical schools. (Teachers in secondary schools, collegiate institutes and colleges are not included.)

All chemists and physicists.

All research scientists.

All persons with degrees in engineering, architecture, forestry, agriculture or any natural science.

Members of the Engineering Institute of Canada, Canadian Institute of Chemistry, Canadian Institute of Mining and Metallurgy, Royal Architectural Institute of Canada—except technically unqualified members, if any.

All members of the provincial associations of professional engineers.

Following much preparatory work, a conference was called in Ottawa on May 11, 1942, at which the presidents of 18 universities together with their deans of science and engineering met representatives of the three branches of the armed services, the Department of Munitions and Supply, National Research Council, Inspection Board of the United Kingdom in Canada, National Selective Service, and the Wartime Bureau of Technical Personnel. The estimated requirements for technical personnel were presented by the three branches of the armed forces, the Department of Munitions and Supply, and the National Research Council, and after discussion, the representatives agreed unanimously as to recommendations to be made to the government.

Effect on students

Since the prospective supply of engineering and science graduates was definitely not sufficient for all the increasing demands of wartime activity, it was advocated that all science and engineering undergraduates should be enabled at least two years before graduation to plan a definite future either in an essential war industry or in some branch of the armed services where they could best make use of their specialized technical knowledge; that an immediate study of the possibility of refresher courses be instituted for graduates who have not been steadily practicing their profession since graduation, or for those who might be transferred where the need is greatest; that attendance in the freshman year of engineering and science courses be increased by channelizing into those fields a number of top-ranking high school students well fitted for such studies who otherwise might not attend a university because of financial reasons, also that the Department of Labour should be asked to make available financial aid to such students according to their necessity.

The conference recommended that the coordinating authority in the execution of the proposals be the director of National Selective Service, and further urged that all military and civil divisions of government and all private industry should route their requirements for technical personnel through the director of National Selective Service.

The recommendations of the conference were at once submitted to the proper government authorities for their consideration. Since the date of the conference, certain of the recommendations have been implemented by governmental action through the National Selective Service, and it appears quite probable that most, if not all, of the others may be acted upon within the near future.

WARTIME SEWAGE DISPOSAL PRACTICE

A group of articles containing significant information on process developments, design changes and construction methods.

Disposal Facilities at War Plants — p. 82
By M. H. KLEGERMAN

Cooperative Sewage Disposal Service — p. 85

Removing Toxic Metals from Pickling Liquors — p. 86
By GEORGE E. BARNES and MATHEW M. BRAIDECH

Corrosion in Digestion Tanks — p. 89

Sewage Flow Relationships — p. 90
By C. FRANK JOHNSON

Manhole Cover of Wood and Concrete — p. 91
By J. M. SMITH

Something New in Settling Tank Design — p. 92
By HERBERT MOORE

Acid Waste Treatment Study — p. 94

War plants of huge size, such as the one illustrated, introduce complex problems in sewage disposal. Site location, as well as volume and character of sewage, all of which are different than those encountered in municipal practice, call for modification of customarily accepted design factors. (See next page).

Sewage Disposal Design For Wartime Industrial Plants

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Design of sewage treatment facilities for war production plants brings new and different problems to the sanitary engineer. Here is recorded some observations on volume and character of sewage produced, influence of site on treatment methods, flow variations in relation to "shift" operations, and recommendations in regard to plumbing changes.

NUMEROUS war production plants in all sections of the country, employing vast numbers of people, have in the last two years brought about the construction of an impressive number of sewage disposal works for industrial sanitary wastes. These disposal plants form a group warranting perhaps a classification as distinctive as that of municipal, industrial waste, institutional, cantonment or resort type of sewage treatment facility.

As in each of these general classifications, so also in that pertaining to industrial sanitary wastes, there appear to be certain differences in habits of the contributing personnel, in volume and character of sewage produced, and in factors affecting plant location and consequently degree of treatment that call for modification of customarily accepted design factors. In the following the writer sets forth some of the changes and special conditions observed as a result of recent experiences.

The nature of the times is such that stress must be placed upon the design and construction of these facilities with little time available to evaluate the results of their operation. Similarly, the need for carefully avoiding disclosures of vital information affecting war production necessitates the omission of certain pertinent data and the naming of specific plants or locations. Comments, therefore, must be generalized, although the observations on which they are based represent design and operation experience gained by the writer's firm in connection with industrial sanitary waste treatment plants in four different states.

In general, industrial plant sites are not selected with regard to sewage disposal needs. Other factors considered more important—such as availability of labor, power, land, materials and military considerations—generally govern. The choice of sewage treatment sits is therefore limited or non-existent. And selection of a receiving stream, or location of outfall at the most favorable point along a given stream, as is frequently the case in municipal practice, is not possible for the reason that it is necessary to confine the facility to the plant property, generally close to the manufacturing buildings.

SPECIAL CONDITIONS AFFECTING DESIGN OF DISPOSAL UNITS

- **Facilities generally must be confined to the factory site, as a result of which, choice of receiving stream is limited.**
- **Extensive floor areas and flat sites call for use of ejector stations in the plumbing system, which results in irregular sewage flows to treatment units.**
- **Provision must be made for industrial wastes treatment with, or independent of sanitary sewage.**
- **Load variations due to "shift" operation may call for duplicate or triplicate installation of certain treatment units.**
- **Per capita flows vary widely from factory to factory, depending on operations and type of workers.**

The following cases illustrate the influence of the industrial site upon adoption of sewage treatment methods:

Case I—Plant to employ 14,000 people. Remote farm-land site. No receiving stream available for sewage discharge. Nearest possible receiving waters 7 miles off property. Cost and inability to secure right-of-way eliminated outfall to these waters. Final disposal to groundwater via percolation beds adopted. Made possible by extensive deposits of suitable sand and gravel and available area. Water table 20 ft. below filter beds. (Extensive water supply from sand and gravel wells, 70 ft. deep, 3,000 ft. from sewage plant, is utilized by factory.) Percolation beds preceded by primary settling. Separate sludge digestion also provided.

Case II—Plant to employ 7,500 people. Site adjacent to small stream (dilution at times negligible). Stream enters larger river about one mile be-

low site and about one mile above public water supply intake for group of important industrial cities totaling 300,000 people. Unable to construct outfall to point below water supply intake. Complete treatment provided including biological filters followed by final sand filtration and chlorination.

Case III—Plant to employ 6,000 people. Site along "suitable" stream. Water from stream utilized for certain industrial operations, principally cooling. Flow at times insufficient for industrial use. Sewage plant effluent returned to stream above factory intake, after chemical treatment, to permit re-use of water.

Plumbing affects plant design

Modern industrial plants, even temporary war plants, provide excellent sanitary conveniences for their employees. These include locker rooms containing group-washing equipment and multi-stall showers; toilet rooms with long banks of urinals and closets; and first-aid stations and hospital facilities. Cafeterias also are provided in many instances. Washrooms and toilet rooms frequently are located on the basement level of the manufacturing building (particularly in the one-story type, as in aircraft manufacture), although they are found also on the various levels of the multi-story office and administration buildings. Drinking fountains are placed at convenient points about the manufacturing area.

Because of the extensive floor areas involved in many types of industrial plants requiring long runs of wastelines, the discharge from the plumbing fixtures is conveyed to a group of conveniently located ejector stations rather than to a single pit or outlet and subsequently raised to a "high" level sewer near the surface. This sewer then may be extended to the disposal plant as a gravity line or as a force main. Often the latter is necessary where the factory site is more or less flat. Incidentally, "flat" sites appear to be favorites for many of the larger factories especially those manufacturing airplanes where a test flying field is part of the site.

The number of ejector stations vary, depending of course on architectural and plumbing layout. Typical of a certain type of factory layout involving a floor area of about ten acres, is one utilizing about six ejector stations, or one station for nearly every two acres of floor space (single-story plant).

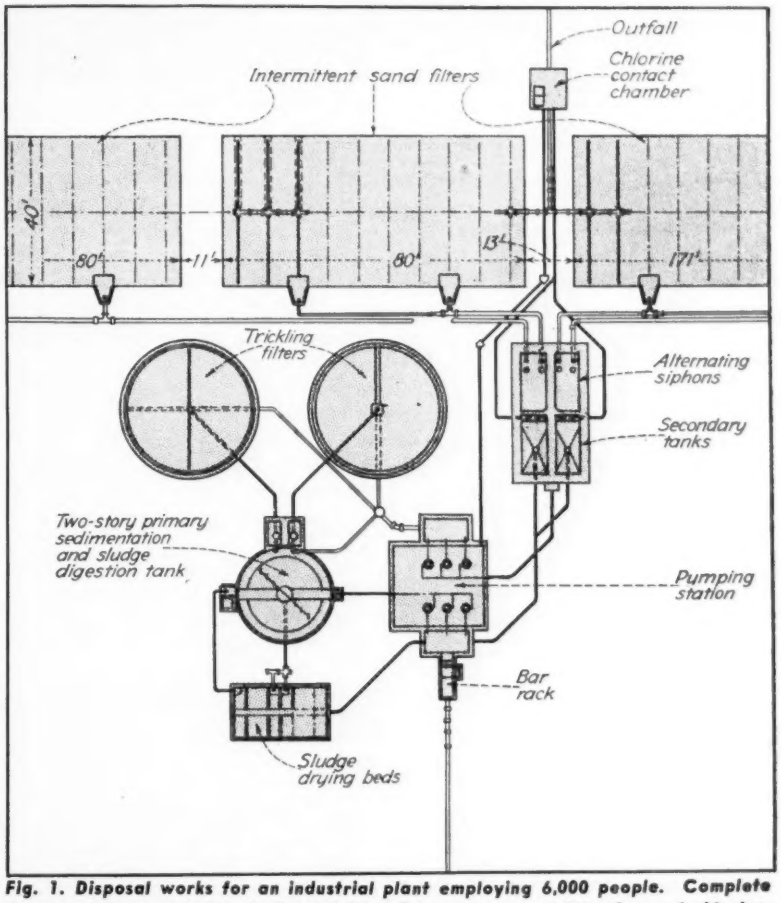

Fig. 1. Disposal works for an industrial plant employing 6,000 people. Complete treatment is provided, including trickling filters, final sand filtration and chlorination of effluent. The primary settling tank is of the two-story type, with sludge removal equipment; the secondary tank is of the hopper-bottom type.

In instances where sewage is thus handled, the size of certain treatment plant units, particularly settling facilities, is related to the number and capacity of the ejectors, giving due consideration to probability and frequency of their simultaneous (in part or in whole) operation. Sometimes this may result in treatment units being entirely out of proportion to the personnel served and to the *average* sewage flows to be handled.

Where reasonable revisions cannot be worked out in the factory plumbing (by the architects), it may be more desirable from the viewpoint of treatment efficiency to re-pump the sewage at the treatment plant, thus overcoming inequalities of factory-ejector operation by proper sizing and relationship of sewage wet walls, pumping equipment and plant units. Such a procedure was adopted in one instance where plain sedimentation was the principal treatment provided, for only in this manner could proper control of the rate of sewage flow in relation to settling capacity be obtained.

If topographic and hydraulic conditions are suitable, inequalities of ejector operation may be overcome by the provision of an equalizing tank and rate controller at the sewage plant inlet. Factory sewage, being quickly collected and delivered to the disposal plant, is very fresh and additional detention in a properly proportioned equalizing tank or wet wall is not objectionable to subsequent treatment.

Factory floor drains as a rule are not connected to sanitary lines, but rather to storm drains. This eliminates grit and other floor sweepings from reaching the disposal plant. Certain types of industrial wastes are handled in the same manner. For example, wastes requiring neutralization are discharged into separate waste lines to neutralizing vats and thence to the storm drain system. Coolants are frequently re-used many times by recovery through filtration

by special equipment at the factory, the dirty coolant containing soluble oils, thereby prevented from reaching the sanitary line.

Industrial waste considerations

The problem of disposal of liquid industrial wastes does not necessarily occur in every instance of war plant operation. Oftentimes the disposal of large volumes of cooling water represents the only "waste" problem, and this, of course, is principally a matter of drainage and does not affect the problem of sewage disposal. However, because of the large roof and paved surfaces involved in the war plants, the matter of drainage demands special attention. As a general rule, separate lines are provided for such drainage purposes. This is particularly helpful in the matter of sanitary waste disposal for it permits the discharge of "harmless" liquid industrial wastes to the storm drainage lines rather than to the sanitary sewers and thus enables reduction in the size of the sanitary waste disposal units.

Industrial wastes that would prove harmful if discharged untreated must, of course, receive special consideration. Whether such wastes shall be treated with or independent of the sanitary wastes, or not treated at all, is a matter to be determined for each individual case. Unless the type and other essential facts concerning the industrial waste to be produced are known in advance of design and adequate treatment processes are available, little can be done effectively in providing treatment with, or independent of, the sanitary waste plant, prior to placing the factory into operation.

If trouble is expected, about the best that can be accomplished as a precautionary measure, is to bring about separation of such waste from the sanitary and storm sewers by the provision of independent waste lines in the factory layout. Subsequent treatment can then be more readily provided after factory operation is established, assuming, of course, that proper treatment (with particular considerations to questions of availability of material and equipment, permanency of the operation, time and cost) can be devised.

Influence of "shift" operation

Obviously, in the design of certain units of the treatment plant, particularly those which are dependent on rate of flow and in the plant hydraulics, consideration must be given to whether the factory is to be operated on one or more daily shifts and the relative "load" to be expected on each shift. Estimates of plant population for different shifts before the factory is placed into service are difficult to make with any degree of accuracy, as under present conditions the plant management itself often lacks complete information.

Accurate estimates, however, are unnecessary if a fairly close determination of the probable number to be employed in the maximum shift and in the minimum shift (which may be "zero") can be made. With the range thus determined, the provision of duplicate and possibly triplicate treatment plant units, the combined capacity of which can properly handle the maximum factory shift, will have the essentials necessary to cope with indeterminate variations that may occur in plant personnel or that must surely occur at some future time when the need for the particular production has been reduced. Doubling or trebling of units may seem wasteful from a structural and economic viewpoint inasmuch as the sewage plant structures for the average factory are relatively small, even if only single units are used. However, the operation flexibility thus obtained is a practical necessity to efficient operation under employment variations due to growth or decline of factory output; holiday and week-end shutdowns; and temporary curtailments due to lack of materials.

Fig. 2. War plants provide excellent sanitary conveniences for their employees, including locker rooms with group-washing equipment and stall showers. This installation pictured is at one of the Owens-Illinois Co. plants.

Per capita sewage flows

Per capita sewage flows from manufacturing plants, though fairly constant for any given plant, are found to vary from factory to factory. The extent of sanitary facilities available and presence or absence of a factory cafeteria will, as expected, influence such variation. However, it is noted that other factors have even greater influence in this respect.

These factors include the nature of the production operation; the presence or absence of air conditioning; the ratio of office personnel to total employment and possibly the predominance of male and female workers. It is noted, for instance, that in a factory where special airplane parts are made, employing on the whole relatively high skilled workers, the per capita sewage flow is considerably less than in a factory making plane assemblies where the workers' skill is of a lesser degree, although other conditions are approximately the same.

Typical per capita sewage flows based on approximately one year's operation of three war plants, are as follows:

Plane assembly plant, 23 gal. per capita
Plane parts plant, 13 gal. per capita
Steel plate mill, 20 gal. per capita

Hourly flow variations at one place where sewage from the factory flows to the disposal works by gravity are illustrated in Fig. 3. As would be ex-

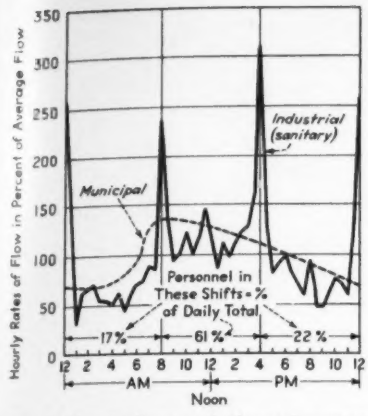

Fig. 3. Hourly flow variations of sewage in one industrial plant compared with average flow changes in a municipal treatment works.

pected, sharp peaks occur at "clean-up" time, that is, before change-of-shift; lesser peaks occur before lunch-time. In terms of average daily flow, the change-of-shift peaks may reach 300 percent, but in terms of average flow for a given shift, the peaks are only about 225 percent of such flows.

It will be observed that these high peaks are of extremely short duration and the frequent statement that "all sewage will reach the plant at lunch-time and quitting time" is far from the actual case. More abrupt flow variations apparently occur in sewage flows from industrial plants compared with municipal sewage flows, because of quick delivery and absence of infiltration. These variations, even if of limited duration, do effect capacities of pumps, siphons, contact chambers and other units.

Type of sewage

The following analysis of raw sewage represents average conditions obtaining at an airplane parts plant employing about 7,500 people:

Per capita flow	13 gpd.
Suspended solids	156 ppm.
Settleable solids	1.5 ml./liter
B.O.D.	320 ppm.
Dissolved oxygen	100 percent saturation
pH	8.6

The following is a comparison of the above wastes, on a per capita basis, with that of average domestic (municipal) sewage:

	Industrial (Sanitary Sewage)	Domestic Sewage	"Equivalent" Population
Flow	13 gpd.	80 gpd.	1/6th
Sus. Solids	0.017 lb.	0.20 lb.	1/11th
B.O.D.	0.035 lb.	0.17 lb.	1/5th

Although on a time basis, an employee may spend about one-third of a day at his job, the foregoing data indicates that sewage production during that time on the concept of population equivalence, is something considerably less than one-third. These data are significant not alone with respect to processes of treatment in which the water load is the governing factor, but also in connection with problems in reduction of organic load (B.O.D.) and in connection with the production, handling and final treatment of the sewage sludge.

With regard to the material difference between the biochemical oxygen demand and suspended solids content (the former being about twice the latter) the explanation probably lies in the fact that urine, which has a much higher B.O.D. than "mixed" sewage (i.e. normal domestic sewage), makes up a large part of the organic load present in industrial sanitary sewage.

It is obvious, of course, that final conclusions cannot be drawn from these data inasmuch as they represent too few cases, although the length of operation in the instances cited represents approximately one year's period.

Cities Find Cooperation Desirable In Providing Sewage Disposal Service

EIGHTEEN of the nation's 30 largest cities, including several in war production areas, cooperate with other municipalities in treatment or disposal of sewage, according to the International City Managers' Association. Four of the cities—Boston, Chicago, Minneapolis and St. Paul—are included in sewerage districts which, set up as separate agencies for the purpose, serve their suburban communities.

Intermunicipal agreements generally take one of three forms. (1) outside cities connected to the sewerage system of a central city pay flat charges for use of the central city's treatment or disposal service; (2) one city disposes of sewage from certain areas of another city or grants certain privileges under reciprocal agreement; and (3) two or more cities build and operate treatment or disposal systems jointly, sharing costs.

Sixteen of the 18 cities—all but Milwaukee and Atlanta—permit use of their treatment or disposal systems by neighboring cities, with as many as twelve cities and nine sanitary districts using facilities of one—Los Angeles. Seven cities, nine sanitary districts and one village connect with the St. Louis sewer system, while Buffalo, Detroit, Columbus and Rochester each have entered into agreements with more than five municipalities.

"Exchange" agreements permitting outside connections are in force between Dearborn and Detroit, Mich.; Baltimore and Baltimore County, and Washington, D. C., and the Washington Suburban Sanitary District.

Milwaukee and Atlanta are parties to joint agreements, with Milwaukee a member of a metropolitan sewage area of fourteen cities. Each shared the cost of building the area's sewer system and they meet operating costs by direct tax levies. The Atlanta and Fulton-DeKalb County sewer system and treatment plant were built in 1937 in cooperation with WPA and other federal agencies. Atlanta pays more than half the operating and maintenance costs.

Malaria-Mosquito Control Advances in Memphis

Memphis, Tenn. carried out a $29,000 program of malaria and mosquito control in ditch construction last year, and now has 83 miles of paved, open ditches to expedite drainage and thus prevent breeding, according to the annual report of the city department of health. Oiling crews spread 106,304 gal. of oil over 4,232 miles of ditches, streams and culverts. Following the oiling season from April to November, workers cleaned 59 miles of paved ditches.

In the elimination of possible breeding places, 51 cisterns, 33 ponds, 136 fish pools, 12 basements and 763 abandoned cesspools and pit toilets were filled, says the report. Inspectors also supervised industrial plants, junk yards and garden pools.

Treating Pickling Liquors for Removal of Toxic Metals

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and

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***Contents in Brief**—An industrial waste containing copper, nickel, chromium and cyanide defied pretreatment with lime, the plant effluent causing objectionable conditions in a stream, and later produced an "upset" in biological functioning of a municipal sewage treatment works into which the effluent was discharged. Research on the problem led to the development of a new iron contact-lime process, one of the merits of which is safe disposal of dangerous cyanide waste products.*

THIS ARTICLE sets forth a method of treatment for acid pickling liquors for the purpose of removing copper, nickel, chromium, or other metals whose occurrence in the raw or neutralized acid wastes is incidental to cleaning and electroplating operations, and whose toxic action is harmful when ordinary methods of disposal or treatment are attempted, because of the inhibiting effect of these metals on either natural or controlled biological processes. The method is superimposed on the usual measures taken for neutralizing with lime, and includes means for the safe disposal of dangerous cyanides.

The treatment process is original with the authors, and is believed to be unique; patent rights to the process, therefore, are reserved by the authors. The process was developed by laboratory experimentation and research, to solve the disposal problem for Talon, Inc., at Meadville, Pa., and has proved successful in operation on a plant scale over a period of several months.

Talon, Inc., are manufacturers of the slide fastener, popularly known to the consumer as the "zipper." Acid baths are required for the cleaning of wire and metal which are used in impressively large quantities, and this spent acid, in combination with the wastes from plating, burnishing, washing and finishing operations, comprise the raw waste liquor to be treated.

Original facilities at the Talon plant for handling the spent acid comprised one neutralizing tank and one concrete settling tank, with pump room between. The tanks, which were lined with acid-resisting brick, were about 5 ft. wide, 7 ft. high and, in length, about 34 and 42 ft., respectively. Each was constructed with ceiling slab and access manholes slightly above grade. Lime was applied to the acid neutralizing tank in calculated quantities and, after testing for pH, each batch of neutralized liquor was pumped to the settling tank and allowed to settle for a period of at least 8 hr., after which the supernatent was pumped into the sewer. In the initial installation, the effluent was discharged in French Creek, on which Meadville is located.

Objectionable conditions developed in French Creek after several seasons of operation, due to the carry-over of copper, nickel, and chromium in the neutralized supernatent, with their toxic effect on aquatic life, and to the accumulation of lime sludge deposits with their characteristic blue-green tint, along the banks of the stream. Therefore, at a somewhat later date, stream conditions were relieved by diverting the neutralized wastes to the Meadville municipal sewage treatment plant, which is of the activated sludge type with facilities for sludge digestion.

After some months of operation, critical conditions developed in the sludge digestion tanks. Gas production fell from a normal yield of some 27,000 cu. ft. per day, to a low yield of about 1,200 cu. ft.; and the bulk of poorly digested and undigested

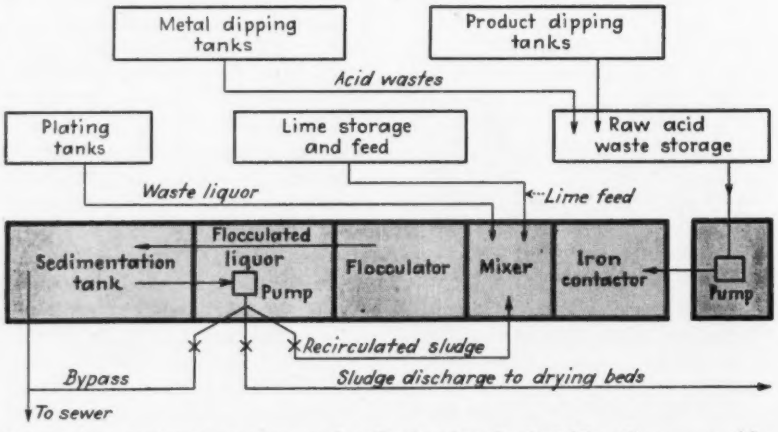

Fig. 1. Iron contact-lime process for the treatment of pickling liquors provides passage of acid waste through a bed of scrap iron turnings, following which separately collected cyanide wastes are admixed. A flow diagram of the complete process is shown above.

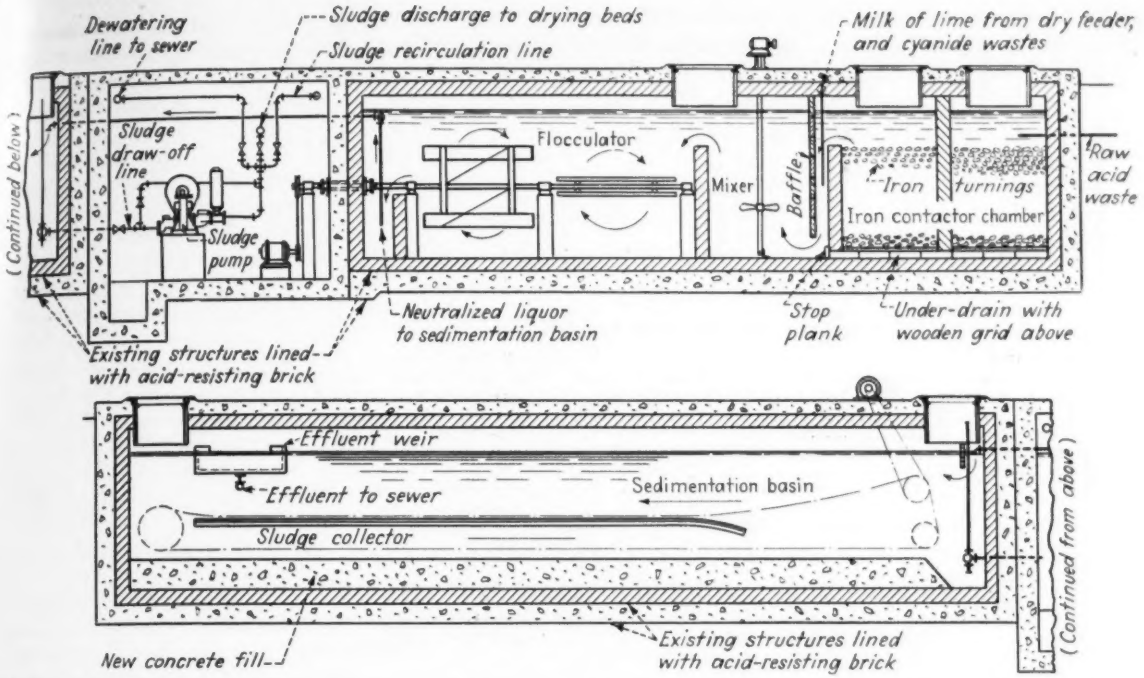

Fig. 2. An existing treatment plant was revamped structurally to provide the processing required with the new form of treatment. This longitudinal sketch shows the arrangement of the principal plant units and some of the piping details.

sludge increased in proportion. To handle and dispose of it became not only burdensome, but practically impossible, even with the construction of additional digestion and drying units. While some improvement was made in the clarification afforded to the neutralized wastes by minor changes in the arrangements for pumping and decanting at the Talon plant, no material improvement was possible by such means. It became necessary to devise a method of treatment for the raw pickling liquor which would deliver an effluent free from the metals causing the difficulty, and which would provide for satisfactory disposal of the sludge produced by the process.

Retardation of digestion

The degree of retardation of the digestion process at the Meadville treatment works became evident when, after analysis, the constituency of fresh sludge was compared with that of the so-called digested sludge and its supernatent liquor. The comparison is shown in Table 1. The difference in character between fresh and digested sludge is noticeably small, and definitely indicates contamination or poisoning of the bacteriological process due to the presence of metallic ions; principally chromates in solution and copper in suspension. The presence of cyanides also is indicated in the analysis.

As a measure of the depressant, or toxic action, by the cyanides, chromium and copper ions on the digestion process, a series of tests was conducted in small laboratory digester units, using a control sample of a normal fresh sludge, and eight samples of the same sludge innoculated to give various known concentrations of the cyanides and metals. A direct comparison of the deterrent effect of the several substances in different concentrations is shown in Table 2. The comparison is based on the volume of the gas production from the several samples, during the digestion period for the control sample or blank. The carbon dioxide content of the gas produced in each case is given to aid in further comparison.

The conclusions to be drawn are apparent on inspection of the table. However, it appears on experiment that there are certain concentrations of copper that tend to accelerate gas production. For instance, in Sample No. 6 (Table 2), digestion was retarded during the first few days, but gas production was then progressively increased, as if catalysed, until at the end of the 17th day the volume of gas produced was double in amount over the control sample. Nevertheless, since copper would be received through the sewers in unpredictable

TABLE I—ANAYLSIS OF SLUDGE SAMPLES FROM THE MEADVILLE SEWAGE TREATMENT WORKS

Filtrate Liquor	Fresh Solids	Digested Sludge	Supernatent Liquor
pH	8.4	8.3	8.1
Carbonate alkalinity (ppm $CaCO_3$)	152	368	50
Bicarbonate alkalinity (ppm $CaCO_3$)	1,990	2,570	1,450
Chlorides (ppm Cl)	20	28	45
Sulfates (ppm SO_4)	60	75	55
Cyanides (ppm CN)	20	10	15
Solids (ppm)			
Total solids	15,950	14,550	12,870
Volatile solids	10,460	9,310	5,810
Fixed solids	5,480	5,230	7,060
Composition of fixed solids (percent)			
Copper (Cu)	6.0	6.7	5.0
Nickel (Ni)	0.0	0.01	0.0
Chromium (Cr)	28.1	22.6	20.6

TABLE II—EXPERIMENTAL DETERMINATION OF THE EFFECT OF METALLIC IONS AND CYANIDES ON THE DIGESTION OF SEWAGE SLUDGE

Sample No.	Inoculation and Concentration of Metallic Ions	Retardation of Normal Digestion	Carbon Dioxide
1	Control [not inoculated]	0.0%	22.0%
2.	CN = 100 ppm [NaCN]	100.0	6.2
3.	Cr ++++++ 10,000 [Chromate]	68.4	4.6
4.	Cu ++ 4,000 [Cu(ous)]	49.4	32.9
5.	Cr +++ 5,000 [Chromate]	41.0	28.4
6.	Cu ++ 1,000 [Cu(ous)]	14.9	26.6
7.	Cr +++ 2,000 [Cr(ic)]	11.6	27.9
8.	Ni ++ 500 [Ni]	9.4	23.2
9.	Ni ++ 200 [Ni]	8.0	23.5

TABLE III—ANALYSIS OF INDUSTRIAL WASTE LIQUORS

Original Samples	Raw Liquor	Neutralized Liquor
Total solids	11,520–36,220 ppm.	14,120–28,850 ppm.
Loss on ignition	3,380–11,680	925– 2,580
Suspended solids	20– 33	8,760–28,850
Loss on ignition	0– 0	978– 2,060
Dissolved solids	11,500–36,190	5,360– 650
Percent solids by volume (centrifuge)	0.1	11– 18
Total alkalinity ($CaCO_3$)	.....	310– 820
Acidity (equiv. $CaCO_3$)	340– 3,080	.....
pH	3.3–2.6	8.5–8.6
Samples After Filtration		
pH	2.5–1.9	8.0–8.4
Copper (Cu)	1,070– 3,710	0.0
Nickel (Ni)	152– 438	0.0
Chromium (Cr)	6,080–22,080	2,300– 4,180

Note: The raw liquor contains mixtures of chromic and chromate salts, and the neutralized liquor contains the chromium only as chromates, as shown by the yellow color of the supernatent.

concentrations, generally harmful, its presence in the sewage must be considered generally detrimental to the digestion process, and therefore should be avoided.

Analysis of the raw and neutralized waste pickling liquors at the Talon plant disclosed a high concentration of the metallic ions which, with the exception of the chromates, are readily converted by lime dosage into their less soluble hydrous oxides. The character and the raw and neutralized plant liquor as determined from samples collected under the original conditions of operation is shown in Table 3.

The volume of the cyanide-bearing wastes as received is small compared with the total volume of wastes to be treated. They show 500 ppm. of total solids, with very little suspended matter; 242 ppm. NaCN; 230 ppm. alkalinity; and a pH of 8.3. This waste contains about 70 ppm. copper but is free from nickel and chromium.

The foregoing analyses and discussion supports the conclusion that the toxic or "poisoning" action of these industrial wastes on bacteriological processes, such as sludge digestion, is due principally to the unremoved chromates in solution and to the copper sludge particles carried over in suspension as the result of inadequate clarification after neutralization.

An extended consideration of the chemistry of chromic and chromate salts, suggested the possibility of complete removal of the troublesome chromates by their reduction to the chromic state [Cr^{VI} (chromate) to Cr^{VII} (chromic)] and their subsequent removal as hydroxides or hydrous oxides by the normal treatment with lime. Laboratory tests with ferrous sulphate (copperas) and sulfur dioxide indicated the feasibility of this method of treatment. Consideration of the cyanides suggested their disposal by the formation of insoluble cyanide complexes, and also double combinations with copper and nickel salts, all of which are of a nontoxic character, and which will form in the presence of ferrous and ferric salts, when the cyanide content is not in excess of the metallic ions.

Determination of treatment

In view of the acid character of the wastes, it was decided to effect reduction of the chromates by passage of the raw liquor through a contact bed composed of scrap iron turnings and borings, which proved to be most economical and at the same time reduced the amount of lime required for neutralization. Some thought also was given to the possibility of salvaging the copper, nickel, and chromium salts, in which case reduction would be properly effected by sulfur dioxide gas in order to avoid contamination with co-precipitated iron. The possibility of neutralizing the waste with dolomitic limestone in contact beds, with a view to effecting economy in chemicals, was further explored by laboratory tests.

In its final form, the treatment process evolved as an iron contact-lime treatment, in which the acid liquors are first passed through a reduction bed of scrap iron with adequate flow-through time to permit interaction with the free acid and reduction of chromates; following which the separately collected cyanide wastes are admixed to avoid formation and liberation of the deadly hydrogen cyanide which would result from direct contact with the raw acid; with subsequent addition of sufficient lime to reach a pH of about 8.4.

The resulting precipitates are quite gelatinous and flocculent in character and, with a small amount of mixing and flocculation, sedimentation is rapidly effected and the bulk volume of sludge to be handled considerably reduced. The sludge is found to have a considerable tendency toward congealing and self-dewatering, and while studies have been conducted on filtering by mechanical means, it was decided for the present to dispose of the sludge by lagooning or drying in the open air, since space is available for the purpose. The sludge contains about 10 percent copper, 2 percent nickel, and about 20 percent chromium; the balance being iron and calcium sulphate.

It was possible to use existing structures for the new treatment works. Three abandoned furnace pits of concrete, located under the operating floor of the factory were lined top, bottom, and sides, with acid-resisting brick or membrane and interconnected to form a common sump or raw waste acid storage vat holding some 15,000 gal. A pump pit was constructed adjacent to these, and a Duriron pump installed for delivery of the waste acid to the existing neutralizing tank, which in turn was converted into a treatment unit including iron contactor chamber, mixing chamber, and flocculator (Fig. 2).

The iron contactor chamber has two compartments with a baffle wall between, and is filled with iron turnings and scrap resting on a wooden grid supported on vitrified tile underdrains. From a dry feed chemical machine housed in the plant, milk of lime is fed to the ferrized acid in the mixing chamber, where the drainage

containing the cyanides, is also introduced. Mixing is accomplished by a monel metal and wood stirring device, and the neutralized liquor is further conditioned in the flocculating chamber before passing on to the existing settling basin, which was equipped for mechanical sludge removal. In the sedimentation basin, the sludge is drawn to the inlet end by a conventional type of sludge collecting mechanism, and the clarified supernatent is skimmed off by an effluent weir and passed to the sewer.

Sludge is drawn by a plunger type pump, and delivered to a drying bed on the property, from which it may be removed at intervals. Sludge may also be pumped back to the flocculating chamber at will, with a view to improved performance if it seems desirable. With the detention periods provided, it is believed that the plant can conveniently handle up to 20,000 gal. of raw acid per day.

Operating experience

In operating the plant over a period of several months, no difficulties have been experienced in securing the expected results. The iron scrap tends to disintegrate and to become compacted, and the operator has found it desirable to probe the mass once a day with a small pipe about six feet long, which is connected to a compressed air supply by means of a hose so as to permit some freedom in moving about. The compressed air liberates considerable hydrogen gas from the contactor chamber, and loosens the mass of iron turnings. Occasional replenishment of some of the iron has not been a burdensome matter. A centrifugal pump already on hand was tried for sludge pumping, but was unsatisfactory and replaced with a plunger type pump. There is no difficulty with cyanides, and random tests indicate that the removal of chromium, nickel and copper is in the neighborhood of 95 percent, or better. The clarified effluent from the plant is now sent to French Creek direct, without the development of any objectionable conditions.

The cooperation of H. M. Groff, works manager, C. L. Phillips, mechanical superintendent, H. E. Freund, superintendent of maintenance, and J. J. Williams, plant superintendent, all of Talon, Inc., is gratefully acknowledged in connection with the work described. C. H. Young, district engineer for the Pennsylvania State Health Department and Roy L. Phillips, city engineer of Meadville, were also very helpful throughout.

Wilbur Watson and Associates of Cleveland, Ohio, are architect-engineers for Talon, Inc., on all plant design and construction. Major equipment for the waste treatment plant was furnished by the Link Belt Co., and Wallace and Tiernan Co., Inc. George A. Rutherford Co. of Cleveland held the construction contract. The authors were consulting engineer and associate consultant, respectively, on the industrial waste problem and the design of the treatment works.

Repair of Corroded Metal In Sewage Digestion Tanks

REPAIRS to corroded steel parts in the digesters of the sewage treatment plant at Watertown, So. Dak., are reviewed by Ralph Reed, city engineer, in a recent issue of *The Clarifier*, official bulletin of the South Dakota State Board of Health. Owing to gases and other soluble compounds in the liquor, some structural steel members of the stirring mechanism broke, and when the digester was emptied it was found that all the members were corroded, some so badly as to require replacement.

Members near the top were the most affected, some having only a fourth or less of the original cross section. Members near the bottom were only slightly corroded or pitted in spots, and were good for many years. Cast-iron manhole steps and welded joints were in good condition, but the wrought-iron heating coils were badly corroded, particularly around the threads, where the metal was thinnest, although no leakage had been noted. Concrete (hard and dense) was in excellent condition, with form marks still visible.

Repair procedures

Structural steel shapes of the same size as the original members were used in the repairs. The old scum-breaking arms on top were cut out with a torch and a new set was fabricated on a platform inside the digester. Electric welding was employed for the connections and the new arms were welded to the center drum, which was reinforced by additional splice plates welded over the original lapped and bolted splices and by welding strap iron wound spirally around the drum. As the tank remained empty for about two weeks after being washed out, it was safe to take a welding torch inside.

In view of the good condition of the manhole steps, it was decided to use cast-iron pipe for the new heating coils. Cast-iron sash weights set into the concrete wall were used as brackets to carry the coils, as the reinforcing bars originally used had almost disappeared. The second digester was found to be in similar condition and was repaired in the same way, except that the outer ends of the scum-breaking arms were not replaced. As some digesters do not have such arms, it was thought that arms under the gas collectors might be sufficient. However, this arrangement has not proved satisfactory, as scum and sludge collect around the outer edge at the top of the digester and break up only when the liquor is lowered in removing digested sludge. This accumulation of scum reduces the tank capacity and hampers satisfactory operation.

Causes and control

Corrosion evidently was caused by gases in the liquor, as it was much more severe at the top, where the quantity of gas would be greatest. Hydrogen sulphide and sulphur dioxide would both produce a weak solution of sulphuric acid, which would attack the metal. Acid-resistant steel would have been expensive, and the manufacturers stated that they were using structural steel.

Mr. Reed stated that a California plant has used a rectifier to apply a positive electric charge to anodes suspended in the liquor, the metallic parts of the digester forming the cathode. This has been successful, as the corrosion in that case was electrolysis, the concrete reinforcement acting as one pole and the metal parts of the mechanism in the sludge acting as the other.

Relation Between Average and Extreme Sewage Flow Rates

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AN EMPIRICAL METHOD often used for determining the rate of sewage flow for which the sewers of a separate system are to be designed, is first to estimate the average rate of flow and then to multiply this by an arbitrary factor to determine the maximum rate. The sewer then is designed for this maximum rate, or preferably, for a rate somewhat in excess of this maximum so as to provide a factor of safety.

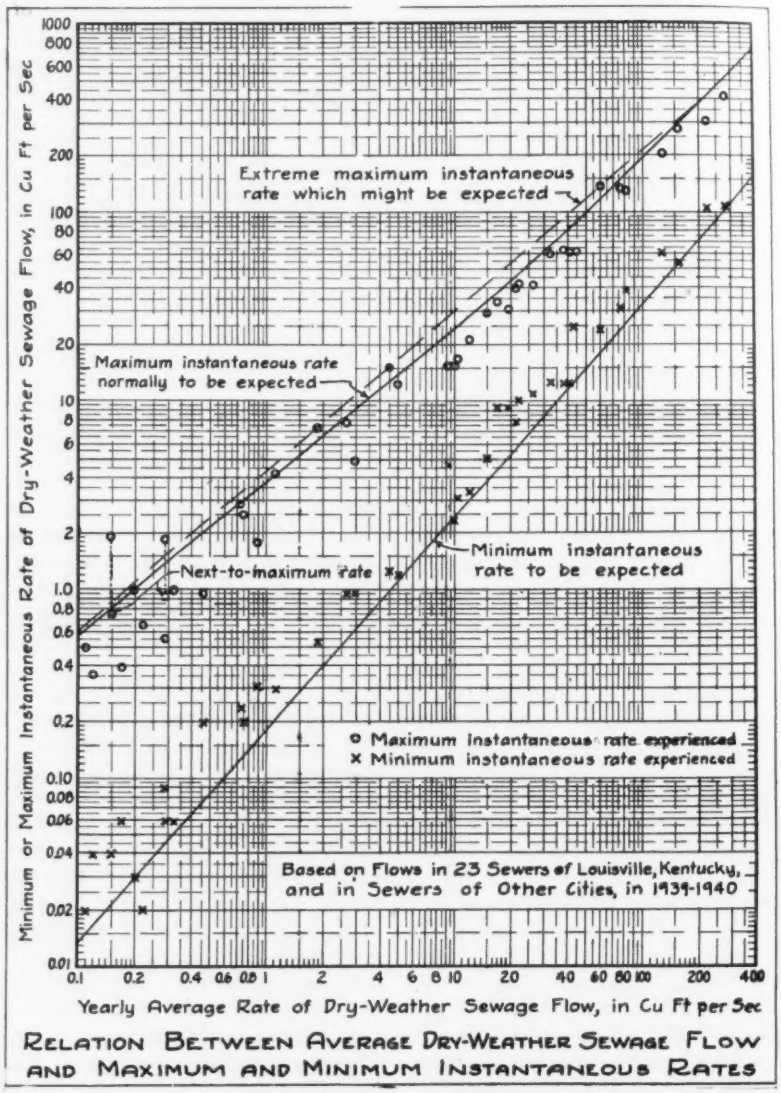
Several formulas and arbitrary factors have been used for converting average flow rates to the maximum rates for design of sewers. (See *American Sewerage Practice*, Metcalf and Eddy, Vol. 1, second edition, p. 236; *Sewerage*, A. Prescott Folwell, eighth edition, p. 34; *Sewerage and Sewage Treatment*, Harold E. Babbitt, third edition, p. 31; and *Forecasting Sewage Discharge at Toledo Under Dry-Weather Conditions*, by Watson G. Harmon, *ENR* June 27, 1918, p. 1233).

However, some of the formulas and factors used, being based on conditions of 20 or 30 years ago, give maximum rates which are, in some cases, below those occurring under present-day conditions. Today, sewage flows are greater, due to the use of larger quantities of water for various purposes, particularly for air-conditioning.

Actual flows measured

The limitations of using empirical factors for determining the relation between average and extreme sewage flows are realized. But sometimes no other method of determination is available. In such cases, intelligent use of empirical factors will prove satisfactory. With this in mind, the accompanying diagram, illustrating the relation between average and extreme dry-weather sewage flow rates, has been prepared.

This diagram is based on dry-weather sewage flow occurring in Louisville and other cities. The Louisville data are based on gaugings made in 1939 by the Commissioners of Sewerage, the data being shown for 23 sewers where gaugings were continuous for long periods, up to a maximum of about six months. These sewers serve districts of varying and mixed types of development, in many cases including industrial and commercial areas as well as residential areas. That the gauged sewage flow could be safely considered equivalent



RELATION BETWEEN AVERAGE DRY-WEATHER SEWAGE FLOW AND MAXIMUM AND MINIMUM INSTANTANEOUS RATES

Actual flow data based on sewer gaugings in Louisville and other cities. Industrial as well as residential flows are represented.

to the yearly average was shown by comparison with the city's water-consumption data. The data shown for other cities is based on flows measured at sewage-treatment plants, adjusted to allow for estimated storm-water quantities.

In the diagram, the minimum instantaneous rates also are shown, as well as the maximum rates. These rates are of use in studying velocities in proposed sewers during periods of minimum flow. At such times, deposits will occur unless the volume of flow is sufficient to maintain satisfactory velocities and depths of flow on the slopes available.

Using the diagram

The diagram is self-explanatory. Given the yearly average rate of dry-weather sewage flow, the maximum and minimum *instantaneous* dry-weather rates are read from the respective curves. It will be observed that the curve showing "maximum instantaneous rate normally to be expected" is drawn slightly above most of the points representing the highest observed rates. This is done to give this curve a small factor of safety, having in mind also that some of the observed rates undoubtedly would be higher if data were available for several years rather than for one year only.

When using empirical diagrams such as this, special or abnormal conditions present or likely to arise should be considered fully, and the data adjusted accordingly. Furthermore, for the design of sewers, the maximum rate of flow shown should be increased to such extent as practicable, to provide a factor of safety. With these precautions, it is thought that the diagram shown will be helpful wherever applicable.

"Duration" Manhole Design Uses Wood Cover and Concrete Ring

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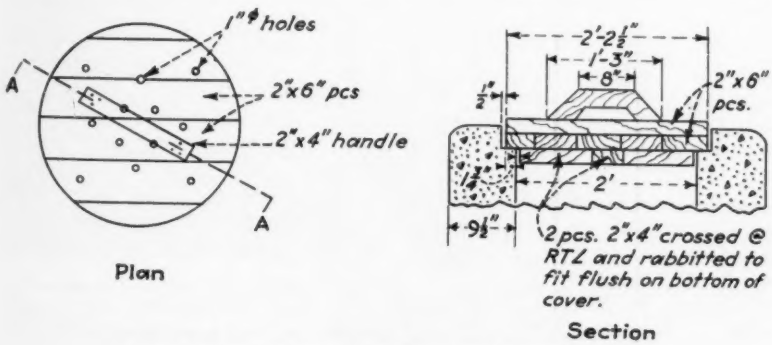
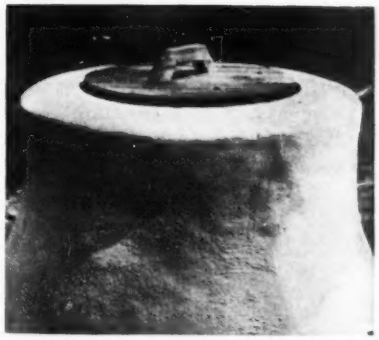
TO CONSERVE VITAL METALS for war use the design of a wood manhole cover with a cast-in-place concrete ring was developed and put into use on outfall lines at an airbase now under construction. As a result the need for some 10 tons of iron was eliminated.

The cover was made of yellow pine and dipped in a creosote-oil mixture, which serves as weatherproofing and preservative. It was constructed of two thicknesses of tongue and groove 2x6 in. boards with two pieces of 2x4 in. material crossed and rabbeted on the bottom to act as a guide for fitting the cover into the concrete manhole ring. The 2x6 in. boards were spiked together with the two thicknesses, each perpendicular to the other for maximum strength. A wooden handle was attached for ease in removing the cover.

Features of design also included: An allowance of one-half inch around the manhole ring for the expansion and contraction of the cover; making the depth of the cover seat in the ring equal to the thickness of a standard cast iron cover so that the wooden covers can be replaced at any time with iron covers.



Design details of the wood cover and concrete frame.



Manhole with cast-in-place concrete ring and wood cover.

The cast-in-place concrete ring was made with a sectional wooden form lined with 24 gauge sheet iron. Sections of the form were connected by bolts thus facilitating the assembly and removal of the form for use many times.

The wooden cover has a weight varying from 50 to 60 lb. The cost of cover and concrete ring in place was approximately three quarters of the cost of the standard cast iron ring and cover.

Reed and Abee of Asheville, N. C., were contractors on the work. G. E. Buckley was project engineer for J. N. Pease & Co.

Soil Corrosion Data Summarized in Bulletin

Recently released by the National Bureau of Standards, Washington, D. C., is a summary of data on a considerable number of phases of underground corrosion, under the title of Letter Circular LC689, *Corrosion in Soils*. The paper, which was prepared by Kirk H. Logan, chief of the bureau's Underground Corrosion Section, is intended to answer oft-repeated questions regarding corrosion.

The field of underground corrosion and its mitigation is covered briefly and non-technically in most of its aspects, and numerous references are given in support of statements, or as supplementary reading. The contents include discussion on the theory of corrosion, soil characteristics, causes of corrosion, soil tests, and methods of mitigating corrosion, including the selection of pipe materials, protective coatings and cathodic protection.

Something New In Settling Tank Design

Herbert Moore

Consulting Engineer
Milwaukee, Wis.

Contents in Brief—A circular, two-story type sewage settling tank recently installed at a summer camp in Illinois, represents a departure from standard practice. One advantage over a rectangular tank is said to be greater ratio of surface area to depth, hence better sedimentation. Of special interest is concrete construction without use of reinforcing steel.

CONSTRUCTED of monolithic concrete without reinforcing steel, a circular, two-story type sewage settling tank has been placed in operation at a summer camp in Illinois where it was necessary to plan an improvement so that no critical materials would be required.

An advantage claimed for the circular design, in addition to the fact that it permitted construction without reinforcing steel, is that it provides better treatment of the sewage because improved settling efficiency can be attained, and consequently more polluting substances are removed than by the use of a rectangular tank. Moreover, accessibility of the various parts of the tank simplifies maintenance.

The structural design requires heavier concrete sections, however, resulting in the use of more concrete than that required for a reinforced tank in order that stresses be in compression or shear, rather than in tension. Special precautions were taken to guard against shrinkage cracks and to insure water tightness. The tank is described in some detail because certain features may be of interest for use elsewhere.

The new tank is part of a disposal plant serving a population of 500 at the Arden Shore Camp. The latter, which is a charitable enterprise for mothers and children, is located on the shores of Lake Michigan, some 35 miles north of Chicago.

Basis of design

Sanitary sewage only enters the tank from toilets, washrooms and the kitchen, diluted by some infiltration of groundwater along the 1,500 ft. of a tributary sewer.

For sewage flow, a figure of 50 gal. per capita per day was assumed; this amounts to 25,000 gal. per day for the summer season of six weeks. Since the sewage is fresh and therefore clarifies rapidly, a displacement period of 1.5 hours only was provided. If a longer displacement period is needed, an auxiliary weir at a higher elevation of the tank may be used, providing a five-hour detention period. A small sewage flow will prevail throughout the winter season when the camp population is 50.

The sludge digestion compartment has a volume of 1,000 cu.ft., or 2 cu.ft. per capita. Following settling-tank treatment, the liquid effluent passes through an existing dosing tank and sub-surface filter, and thence to the lake.

The outside diameter of the tank is 21 ft., and the total depth is 16 ft. The bottom portion—some 6½ ft. in depth—consists of an existing septic tank. This tank is encased on the outside by concrete, which serves as a footing for the new tank walls.

Existing tank encased

The encasement walls extend to the surface of the ground from a depth of 6½ ft. and they were poured between the existing septic tank and the natural stiff clay soil. Their width was determined as a footing to provide an average soil-bearing pressure of 3,000 lbs. per sq.ft., and a minimum width of 12 in. The footing was laid out in circular pattern to an outside diameter of 21 ft., except at the corners of the existing septic tank, where an extra foot of width was required at each corner, to permit installation of a keyway and sheet-

Fig. 1. Surmounted on an existing septic tank, which now serve as a digestion compartment, this circular structure is a two-story settling tank for sewage disposal. A hollow-cone shaped concrete baffle wall and concrete effluent weirs are built inside the tank.

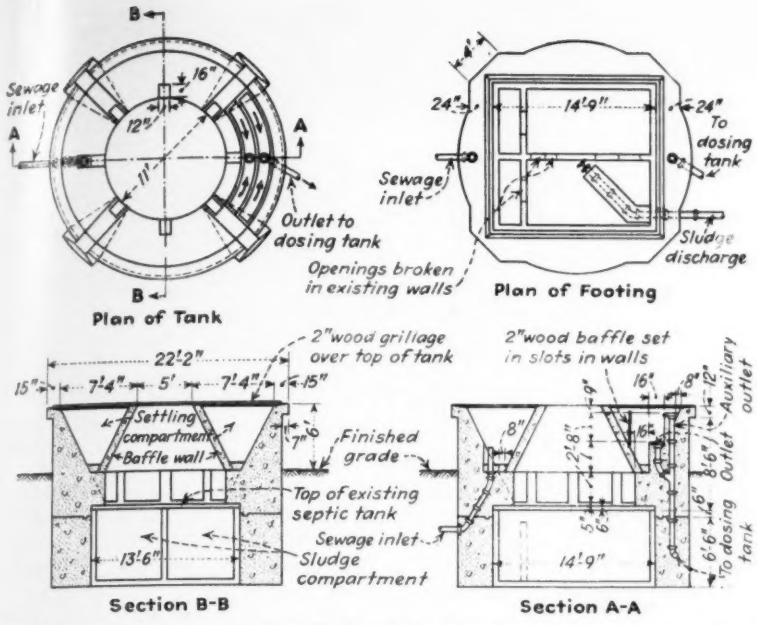


Fig. 2. Design and construction details of the circular two-story tank. It is to be noted that the structure is built on top of an existing, rectangular septic tank.

metal water-seal joint entirely around the tank.

Use of the existing septic tank speeded construction by enabling concrete to be poured immediately following excavation around the tank, without the necessity of form construction, or any further preparation. Furthermore, a saving resulted, not only on excavation for the tank volume, but also on form lumber, none of which was required for the footing wall.

Outside and baffle walls

Supported on the footing, the formed concrete walls are vertical on the outside, and have a steep batter of 1.83 to 1 on the inside of the tank in order to serve as a deflector wall for sewage particles in the settling compartment. Thickness of the wall varies from 8 in. at the top to 5 ft. at a depth of 8 ft. 9 in. At the top of the wall, a 15-in. walkway is supported by means of a 7-in. projection from the wall section. For structural purposes, to which further reference will be made, the outside walls also comprise pilaster sections, located above the corners of the existing septic tank.

The baffle wall, or inside wall of the settling compartment, is shaped as the hollow frustrum of a cone, 8 in. thick. Supported on eight buttresses, 12 in. wide, which are poured integral with the outside wall, the slope is the same as for the outside wall, namely 1.83 to 1. An 8-in. slot between the outside wall and the baffle wall provides the opening through which the settleable sewage solids pass to the sludge digestion compartment below.

How the tank operates

Sewage enters the tank through a 6-in. vitrified tile pipe, encased in the concrete wall; the outlet arrangement is similar. Flowing through the settling compartment, which surrounds the baffle wall, settled sewage leaves the tank over the concrete outlet weir.

For the 1½-hr. displacement period, the lower of the two outlet weirs is used, which establishes an area of liquid surface of 135 sq.ft., a flowing-through channel depth of 3 ft., and a freeboard of 3½ ft.

For the 5-hr. displacement period, the upper weir is placed in service by merely inserting a plug in the lower outlet. The area of liquid surface then becomes 240 sq.ft., the flowing-through channel depth 5 ft. 8 in., and the freeboard 9 in.

To prevent the overflow of floating solids, a wood baffle-board extends across the outlet side of the tank, resting in slots provided in the concrete walls.

Sludge removal from the digestion compartment is accomplished with the aid of the hydraulic head of the sewage in the tank, the sludge passing through a 6-in. vitrified tile pipeline laid from the bottom of the tank to a low-lying area 100 ft. distant. Sludge may be drawn by opening a gate valve set in concrete. The valve is located on the inside of the tank and equipped with an extension stem up through the wood grillage cover on top of the tank.

Concerning tank operation it may be observed that the circular tank provides for better sedimentation than would be the case for a rectangular-shaped tank. The main factor contributing to the improvement is the greater ratio of surface area to depth of settling compartment than is believed feasible to allow for a rectangular tank. Also the circular route of the flowing-through channels reduces short-circuiting, and the relatively long outlet weir (11 ft. for the

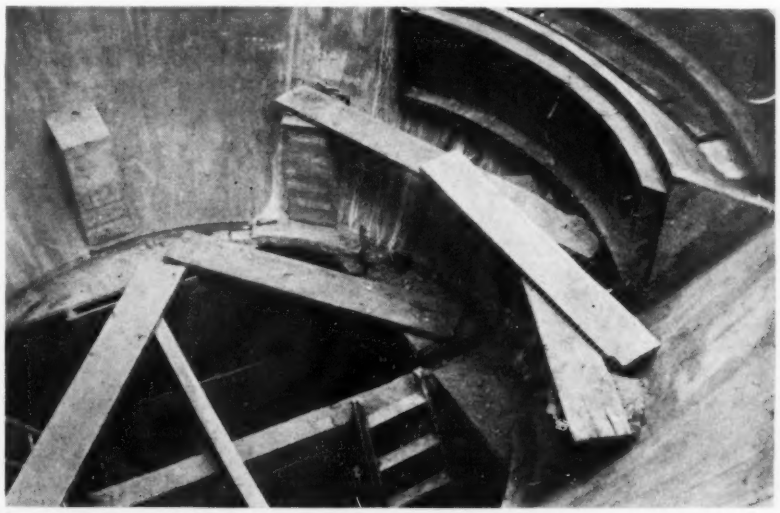


Fig. 3. Interior of the tank before construction of the inverted cone baffle wall. The outlet weir section is shown in the upper right corner.

lower weir), keeps outlet velocities at a minimum, all of which contributes to increased settling efficiency.

It should be pointed out, however, that the additional area of the settling compartment is obtained partly at some sacrifice of the area generally provided for gas venting in rectangular tanks. The opening to the sludge digestion compartment is 5 ft. in diameter, providing a gas vent area of 7 percent of the area of the tank. On rectangular tanks, the gas vent area generally is 20 percent, which is believed to have been established mainly as a minimum for tank maintenance and access purposes. Since unusually good access has been provided in the circular tank through the 5 ft. dia. opening, it was permissable to reduce the percentage of gas vent area in relation to the total area.

Construction methods

In the construction of the outside walls, special treatment was necessary as protection against shrinkage cracks. Wall thickness reaching a maximum of 5 ft. constitutes a different problem than has generally been encountered on small tank construction, and provision of joints to cope with shrinking and cooling of the large mass of concrete was necessary.

Hence the walls above the footing were divided into four main sections, and two sets of forms were constructed for the pouring of two opposite wall sections. Forms then were removed and used again for the final two sections. Use of keyways permitted later installation of inlet pipe and outlet weirs, and provided slots for the wood outlet baffle.

Pilaster sections were constructed between the main wall sections. At the base, at the outside wall line, the pilaster sections are 4 ft. wide and project out from the wall 12 in., in order to provide cover for the horizontal water-seal joint and keyway in the footing. To effect a reduction in the volume of concrete required for the pilaster sections, their width reduces to 18 in. at the top, producing a tapering effect, which contributes to the appearance of the tank. Sheet-metal expansion joints were installed in all vertical joints to prevent leakage.

The baffle wall was poured as a single unit. Paper was laid on the buttresses to prevent bonding at the support, and to allow for contraction in the baffle wall due to temperature change. Concrete toes were placed between the outside wall and the baffle wall to prevent any tendency leading toward outward movement.

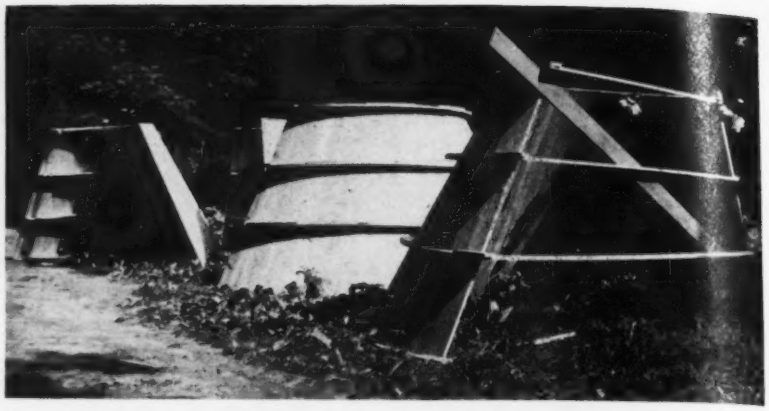


Fig. 4. Wood forms for the baffle wall prior to their placement in the tank.

Griffis Brothers of Lake Forest, Ill., held the $4,000 contract for the work, which was completed in 45 days. The tank was designed by the writer.

Acid Waste Treatment Needs Accentuated by War Effort

TREATMENT and disposal of dilute acid wastes produced by chemical industries has been, in many instances, a considerable problem. Expansion of these industries engaged in war work has made the problem more acute, according to Willem Rudolfs, of the New Jersey Agricultural Experiment Station, in a report on acid waste treatment presented to the American Chemical Society.

The wastes consist mainly of mixtures of acids or mixtures of acids, alkalies and some poisons. Discharge of these wastes causes corrosion of sewers, affects sewage treatment processes or, if discharged directly to water courses, interferes with fish life and self-purification of the streams.

Tests indicate treatment

Laboratory and plant experimentation, using as neutralizing agents various types of hydrated lime and limestone, soda ash, caustic soda and combinations, were made for the purpose of (1) pre-treatment and subsequent discharge into municipal sewers, and (2) complete treatment with discharge directly to the stream.

Study of volume and strength of the wastes at its sources showed great variations. Relatively strong wastes do not mix in the sewer, but appear to pass in mass for a distance of at least 3,000 ft. in spite of turbulence caused by the flow through the sewers. Equalization basins are required before complete or pre-treatment. With suitable mixing devices neutralization with high-calcium or high-magnesium hydrated lime is completed in a period of from five to fifteen minutes.

No sludge problem

Quantities of thin sludge are formed, varying from 5 to 25 percent of the total volume, depending upon the kind of acids, type of lime used, the concentration of the acid, and degree of neutralization. Dewatering of the sludge is comparatively easy, provided sedimentation for at least two hours is employed and reaction control is practised. To avoid sludge formation soda ash is preferred to caustic soda; the latter may cause intense colors. Partial neutralization with lime, followed by soda ash, is feasible.

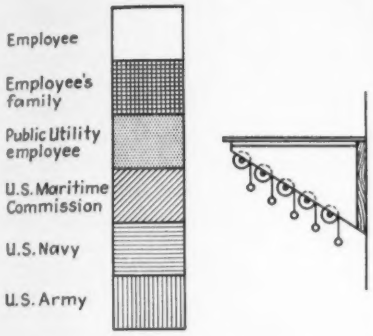
For pre-treatment, stated Dr. Rudolfs, a plant consisting essentially of equalization and mixing basins, provided with return facilities, lime-feeding devices and three-way automatic pH control has been built.

From Field and Office

WORKING PROBLEMS AND TIME-SAVING METHODS FOR ENGINEERS AND CONTRACTORS

Photographic Backgrounds On Identification Badges

Industrial plants that make use of identification badges showing a photograph of the person to whom it was issued, sometimes find advantage in using a background convention in the photograph that at once classifies the individual. For example, these



Cross-section of "map-hanger frame" on which the backgrounds are hung and samples of six different conventions that have been used.

classifications might be (1) employees, (2) employees' families, (3) utility company employees or representatives of (4) U. S. Maritime Commission, (5) U. S. Army, and (6) U. S. Navy.

To simplify the making of photographs with these backgrounds, a rack is used in the photographer's studio on which are hung six roller shades each with a different convention in lines or dots. The person to be photographed sits in a chair immediately behind which is pulled down one of these screens, thus providing a background with any one of the six identifying conventions.

Useful Instrument Trivet

A small brass trivet has been found very useful for instrument work around the jobs of bridge division of the city of Chicago. The accompanying photograph shows it being used by George Bartels, instrument-man, to set grades on foundations for the new Canal Street Bridge. With this

Small brass trivet facilitates level work in tight places.

trivet a firm set-up can be made on the frame of the cofferdam at a point where a standard tripod could be set only with difficulty and where it would be in constant risk of being knocked over.

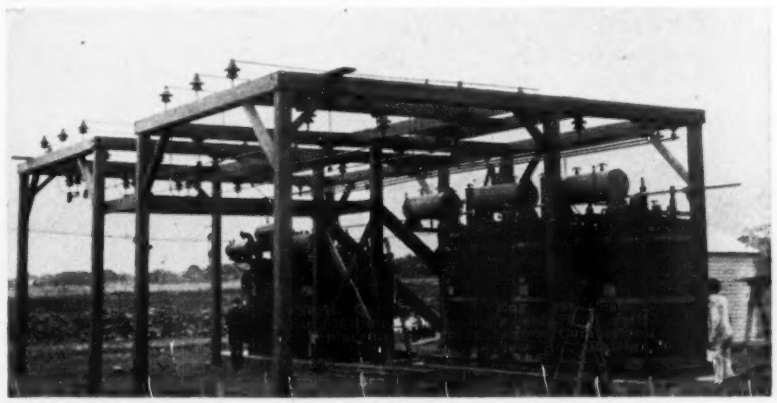
The trivet can be set on a surface as narrow as 7½ in. It is made of brass, weighs about 10 lb., and has adjustable legs of the screw type. It was designed originally for use with a transit, being high enough to permit a plumb-bob to be hung under the transit.

Wood-Frame Substation for An Army Camp Saves Steel

In connection with the construction of an army camp in the eastern part of the nation, a substation was constructed to step down the supply voltage from 26 to 4 kv. through the use of six 667-kva. transformers. In order to place this substation in service in the shortest possible time, and with the use of a minimum of critical structural materials, the buses and switching equipment were supported on a timber instead of the usual structural steel frame. This substitution, which resulted in a saving of six tons of steel, was made by using the column spacing and beam layout of the steel design shown in the accompanying photograph.

Due to the necessity for speed in construction it was desirable to use the standard substation switching equipment layouts that had been prepared based on the use of a steel structure. The switching structure consists of two sections 18 ft. wide, placed 8 ft. apart, each section having two bays of 16 ft. and 11-ft. spans. The posts are 8x8-in. timbers, the main members two 3x10-in. planks spaced 5½ in. apart, and the secondary members are 3x10-in. and 4x10-in. timbers. The tops of the posts and main members are 16 ft. above grade.

All the members were given a two-coat brush treatment of creosote, which is considered adequate protection during the expected life of the structure. The posts are set 3 ft. in the soft shale, and it is planned to apply a preservative treatment around the butts, from time to time, for protection against decay at the ground line.



By substitution of wood for steel in building the framework of this army camp substation a six-ton saving of steel resulted.

Book Notes and Reviews

The month's addition to the engineer's reading and reference list

Cement Durability

CEMENT DURABILITY PROGRAM—First Interim Report. Central Concrete Laboratory, North Atlantic Division, Corps of Engineers, U. S. Army, 320 Washington St., Mt. Vernon, N. Y. $4.25 (Make checks payable to the Treasurer of the United States.)

This first interim report on the Cement Durability Program, conducted by the Central Concrete Laboratory, North Atlantic Division of the Corps of Engineers, is available for limited circulation. It covers work performed to date to develop data that will permit the preparation of an acceptance specification for portland cement, which would provide a greater assurance of durability in concrete exposed to severe weathering than is obtained from existing specifications. A factor of major importance, which has been developed to date, is that portland cement treated at the mill with Vinsol resin is outstandingly superior in resistance to weathering to all of the untreated portland cement tested. Six types of treated cement are being studied in the research program.

About Shipbuilding

HANDBOOK OF SHIP CALCULATIONS: CONSTRUCTION AND OPERATION—Third Edition. By Charles H. Hughes. 558 pp. McGraw-Hill Book Co., New York and London. $5.

PRACTICAL PRINCIPLES OF NAVAL ARCHITECTURE—Second Edition. By S. S. Rabl. 218 pp. Cornell Maritime Press, New York. $2.

AN INTRODUCTION TO SHIPBUILDING—By the Shipbuilding Division, Bethlehem Steel Co. 67 pp. Superintendent of Documents, Washington, D. C. 20c.

Expansion of the nation's shipbuilding facilities has stimulated new books on shipbuilding or revised editions of standard works. The new edition of Charles H. Hughes' handbook falls in that latter class. It includes a great deal more than information on shipbuilding, being a text covering the operation of ships as well as their construction. The book is written chiefly for naval architects, marine engineers, ship draftsmen and deck officers. Readers of this journal who have gone into shipbuilding as a new venture will find the book of value because of its wide scope. For example, the book presents in concise form much valuable information on the power plants and machinery that builders must put into new ships. Of special value to ship designers are the tables giving sizes and properties of structural shapes peculiar to ship construction.

The two smaller books are written for men lacking training in naval architecture. They are designed to serve more directly the men in the shipyard. S. S. Rabl addresses his book especially to those men in the shipyard who wish to obtain a better grasp of the job they have in hand but who lack time for a full study of the subject. The booklet prepared by the Bethlehem Steel Co. for the War Production Board relates chiefly to metal work in shipbuilding. It also contains a valuable list of ship terms and their meaning, an organization chart for ship construction operations and brief statements concerning the engineering work of ship construction and the outfitting of ships.

Earlier notes on shipbuilding books were published in *ENR* July 31, 1941, p. 182 and June 4, 1942, p. 935.

Camouflage for Industry

MODERN CAMOUFLAGE—By Major Robert P. Breckenridge. 280 pp. Farrar & Rinehart, New York and Toronto. $3.50.

Clearly and concisely, Major Breckenridge has set forth in this little book the essentials of camouflage as they relate to civilian operations. In less than 300 pages, many of which are given over to well chosen illustrations, he has summarized what has been learned of the "new science of protective concealment" in the exhaustive studies conducted by the Camouflage Section of the Engineer Board, U. S. Army. Industrialists concerned over the safety of their plant can read this book with profit, for it fulfills the hope expressed by the author in his preface "that it will knock some of the hokum and mystery out of camouflage". Engineers interested in protective concealment for industrial plants will find it by far the best book yet written on the subject. It is full of specific answers to the many questions that arise when plans made on a drawing board or a model table must be converted in reality in the field.

Miscellaneous Notes on Booklets and Reprints

BLACKOUT REQUIREMENTS FOR HIGHWAY MOVEMENT, a set of specifications prepared under the direction of the Chief of Engineers, U. S. Army, by the Engineers Board, can now be obtained from the U. S. Office of Civilian Defense, Washington, D. C., or from the local OCD offices.

THE INDIAN CONCRETE JOURNAL, Bombay, India, combined its May and June issues to produce a "Special Air-Raid Precaution Number." Included are descriptions of designs for air-raid shelters and descriptions of numerous types of such shelters built in India, also a large amount of information on the effect of bombs and incendiary bombs in buildings in the British Isles.

A FORECAST OF STATE HIGHWAY REVENUE AND EXPENDITURES for the years 1942-1945 has been prepared by the Bureau of Highway Research of the Illinois Division of Highways, Springfield, Ill. This is an attempt to determine the fiscal position of state highway funds due to curtailment of motor vehicle use under war restrictions. Over against anticipated revenues the research staff has set the amount of the fixed costs of debt service, maintenance and overhead to determine what money probably will be available for construction.

VALUABLE HELP for the engineers who are now assisting in the vocational guidance work of secondary schools in their local communities is found in a new publication of the Engineers' Council for Professional Development, 33 W. 39th Street, New York City, titled "Manual for Committees of Engineers Who Aid Young Men Interested in Engineering Education and Engineering Profession." The best method for organizing a local committee is given, as is information on how to make talks to groups of students interested in engineering and how to interview individual students.

(*Continued on p.* 105)

The Chemical Engineer cuts years to months...

Born in the turmoil of the last war, he is shaping a new world with mighty swords and magic plowshares

GERMAN CONSUL-GENERAL HOSSENFELDER, writing from New York on March 3rd, 1916, to von Bethmann-Hollweg, chancellor of the Imperial German Government, confidently predicted defeat for the United States because we were totally dependent upon the great chemical industry of Germany. "Americans," he wrote, "can never establish such an industry. They have the resources but they lack the necessary science and technology. And, besides, the conflicting selfishness of American business renders it impossible."

Even before the ink was dry on Hossenfelder's letter a new figure appeared on the industrial scene—the American chemical engineer. With the help of patient, but progressive and venturesome capital, he laid the foundations for the largest and most resourceful chemical industry in the world.

Today he is an all-important figure. For we are fighting a chemical war, even though the emphasis that is placed on planes, tanks, ships, guns and other armament tends to obscure that fact. And this chemical engineer is waging war for us on a prodigious scale. Bombers carry more tons of more deadly explosives because he has developed stronger and lighter alloys and more efficient fuels. Tanks are better armored and wield heavier blows because of products and processes born in chemical laboratories. Ships are welded together by new metallurgical techniques that save precious months over older processes. Gun barrels that are made in minutes instead of hours shoot farther and faster because of better ammunition.

And quantity keeps pace with quality. By mid-year of 1942, explosives were being produced in newly constructed plants twelve times faster than a year ago. Smokeless powder output has been doubled since December. Five times as much TNT was being made in July as in the months preceding Pearl Harbor. One single new plant produces more of this high explosive than did the entire pre-war industry—and several of these plants already are in production.

By what Major General William N. Porter, Chief of the Chemical Warfare Service, calls a "miracle of production," the sort of incendiary bombs that General Doolittle's lads showered on Tokyo were rolling out of our plants within a few weeks after we got into the war. As General Porter puts it, "they were rolling not by hundreds or even thousands, but by the millions." That record he has cited as a tribute to the "ingenuity, industriousness and patriotism" of the American chemical industries.

Yet the General agrees that we have only started to produce in the tremendous volumes that will shortly make Germany, Italy and Japan "revolve on their boasted Axis." Our newest plants are just coming into production. They face no limiting shortages of materials for, in the main, our chemical industry draws its strength from coal, salt, sulphur, limestone, oil, natural gas, coal-tar, air and water—all available in abundance.

We have heard little about the use of poison gas by our enemies. It may be that good reasons for this are stored away in our well-stocked chemical arsenals. American chemical manufacturers have worked hard and long with our armed forces so that if the time ever comes to make good on the President's warning of retaliation, America will be more than ready.

And defense against gas has not been overlooked. Every soldier is equipped with a most efficient type of gas mask, developed through twenty-five years of intensive research. The Chemical Warfare Service already is manufacturing millions of masks for distribution to civilians. Let us hope we may never have to use them. But if we must, we need have little fear of any gas or secret chemical.

This gas mask program has been made possible by a literal metamorphosis of production facilities, as peacetime industries have been converted to war purposes. A lumber company, for example, is making activated carbon from sawdust. Novelty manufacturers of rubber goods are turning out valves and assembling other parts. Former manufacturers of shirts, swim-suits, shoes and beds have converted their facilities and are contributing their share. More than eleven hundred contractors and two hundred and fifty sub-contractors are supplying their full quotas of chemical warfare materials. And production is right up to schedule.

But the bulk of the war job of our chemical industries has to do with items other than weapons and

ammunition. The German Consul-General, in that 1916 report to Berlin, said that many American industries were in a critical condition because of the scarcity of German chemicals. He related in particular that "the cries for help from the world of physicians are becoming louder and louder and more and more insistent." Thanks to our chemical industries this cry no longer is heard. Even though we are again cut off from quinine, camphor and some other strategic medicinals, our homes and hospitals are adequately supplied with synthetic products. Most of these are better and cheaper than the natural materials. The same sulfa drugs that have saved so many civilian lives in recent years have gone to war, with the result that deaths from infection at Pearl Harbor and Bataan are reported as surprisingly low. In this war we suffer no shortages of iodine and potash. Pioneering research in the field of vitamins has led to new industries that are contributing to health and better nutrition.

Those new uniforms the soldiers are wearing are of better quality and will last longer than the shoddy, ill-fitting outfits of 1918—thanks to sunfast dyes and new man-made products. And in the field of fabrics, nylon and the new rayons have gone to war in parachutes and super-strong cords for tank treads and tires.

* * * * *

And that brings up the question that 30,000,000 American motorists are asking with ever increasing concern. "When, Mr. Chemical Engineer, are you going to give us a set of new tires for the old family bus?"

That, I am told, is just what the chemical engineers have set about to do on a scale that is difficult to comprehend. In the words of Raymond Clapper, the columnist, "the synthetic rubber program for this year and the next is the biggest job of chemical engineering ever undertaken in the world." A billion dollar industry is being built at record speed to make almost a million tons a year of chemical rubber to serve our war needs and those of our allies. This cannot be accomplished overnight. Many months are required to design and fabricate complex equipment, much of which must be made from corrosion-resisting metals and alloys. We shall be lucky if a tenth of the desired capacity is in continuous production this year and even more lucky if, by the end of next year, the new industry should be turning out synthetic rubber at a rate of 875,000 tons—using both petroleum and grain as raw materials.

All this, of course, must go for essential military uses but there is reason to believe that in the laboratory and pilot-plant stages we have some promising substitutes and stop-gap materials that may tide us over until the big program starts rolling.

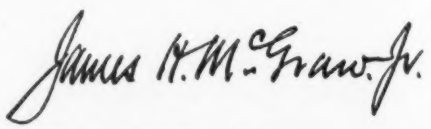
The present prospect of real success is possible only because of the cooperation of the chemical, rubber and petroleum industries. Individual firms and entire industries have set aside their normal desires and selfish interests to pool their patents, share their research and engineering developments for the common good. Synthetic rubber is here to stay as the basis for a great post-war industry: no doubt as to that lingers in the minds of the men who have seen many other natural products—indigo, alizarine, camphor, vanillin—all eventually fall before the ingenuity of the chemical industry.

* * * * *

In the coming peace to which we look forward hopefully, we shall find a new world full of new materials, new conveniences, new jobs, new opportunities, all stemming out of the present-day work of the chemical engineer. The same tough, transparent plastics that now make noses for bombers will give us new frameless windows for our homes and automobiles. With capacity to produce at least 2½ billion pounds of aluminum, which is five or six times pre-war production, and a magnesium capacity 50 or 60 times the pre-war figure, many new uses will develop for these structural materials of great strength and amazing lightness. Almost anything that flies, runs, moves, or otherwise is motive, will have a place for them. New fibers such as nylon and vinyon had scarcely got started before they were put to war use. Once the war is over they will be with us in greater abundance and at lower cost for a variety of uses so vast and so diverse that we can scarcely imagine them.

And the chemical engineer continues to create and to invent. He meets the challenge of scarcities and shortages with ever new "substitutes" that excel their originals. Even before the war is over he will have placed at our command a hundred new materials which we did not have before. His workshop is all industry. His contributions are as limitless as are our needs.

But right now his all-important job is to help win the war; to fight to a finish the ruthless and resourceful enemies that are devoting all their science and technology to bring about our defeat. So, as we take stock of our assets in this desperate struggle, we count among the first the proved resourcefulness of the research-minded chemical engineers we now have mobilized to help us fight this chemical war.



President, McGraw-Hill Publishing Company, Inc.

This is the fourth of a series of editorials appearing monthly in all McGraw-Hill publications reaching more than one and one-half million readers.

Exide

BATTERIES
FOR CRANKING
DIESEL ENGINES

THE more we save, the more we'll have. That's most important today. Wasteful buying, and wasteful misuse of equipment, are *out* for good.

Remember this, when caring for your dependable, long-lived Exide Batteries. Follow the simple rules printed on this page, follow them faithfully . . . and you're really working for America. Take care of your equipment, and help a lot of fighting Yanks take care of the Axis.

YOUR SCRAP will help WIN

AND HERE'S OUR PRESCRIPTION FOR BATTERY CARE!

1. Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.
2. Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.
3. Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.
4. Record water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 2399.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

BRIDGE, KENTUCKY

OWNER: Kentucky Department of Highways, Frankfort.

PROJECT: Construction of concrete overhead bridge on Fort Knox-Brandenburg Station Road, Hardin County, Ky. Spans Illinois Central Railroad tracks and old U. S. Highway 31-W. Involves erection of three 50-ft. and one 173-ft. continuous concrete girder spans. Length, 332-ft.; height, 24-ft. clear; and width of roadway, 26-ft.

CONDITIONS: Contractor to furnish all materials and complete work by June 16, 1943. Rail facilities available via Illinois Central at site of work; highway transportation on U. S. Highways 31-W and 60 also at site; and water transportation available to West Point, Ky., on the Ohio River. Wage rates specified are: skilled labor, $1.25 to $1.50 per hour; semi-skilled, 70c. to $1.25; and common labor, 67½c.

BIDS: Six bids were received August 14, 1942, ranging from the contract low of $106,389 to $119,592. Awarded August 18th.

LIST OF BIDDERS:

1. Nally & Mudd, Springfield, Ky. (contract) $106,389
2. Harry O. Wyse, Frankfort, Ky 109,611
3. Lyons & Breeden, Rogersville, Tenn 111,578
4. Tye and Wells, Carrollton, Ky 114,376
5. George M. Eady Co., Louisville, Ky 119,090
6. R. R. Dawson, Bloomfield, Ky 119,592

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Class A concrete	747.6 c. y.	$26.00	$30.00	$28.00
2. Class B concrete	3,056.0 c. y.	21.90	21.00	23.00
3. Class D concrete	33.2 c. y.	60.00	70.00	70.00
4. Steel reinforcement	212,220 lb.	.06	.06	.06
5. Structure excavation, common	2,650 c. y.	2.00	3.00	2.00

HIGHWAY AND BRIDGES PENNSYLVANIA

OWNER: Pennsylvania State Highway Dept., Harrisburg; T. C. Frame, chief engr.; E. E. Brandow, bridge engr.

PROJECT: Construction of 18.713 linear feet of graded and drained highway, 34 to 66-ft. and varying in width, including five concrete structures. Also including 820 linear feet of concrete paving, 48-ft. and varying in width; 18 ft. of bituminous surfacing for paving railroad crossing; two timber deck bridges, one reinforced concrete deck bridge, and concrete abutment for structural steel bridge. Located on Legislative Route 170, Section 17 (Traffic Route 309) in Luzerne County, Pa.

CONDITIONS: Contractor to furnish all materials except steel for bridges which must be salvaged from State Highway-owned stocks located at various points throughout the state. Some of this must be reworked and fabricated to the requirement of this project. Material for bridge floorings has not been decided upon. Steel must be reclaimed, straightened and transported by contractor. Rail and highway transportation facilities available to site of work. Time for completion 365 calendar days. Minimum wages specified are: skilled labor, 75c. per hour; semi-skilled, 50c.; and common, 45c.

BIDS: Four bids were received August 7, 1942, ranging from the contract low of $608,621 to $770,478.

LIST OF BIDDERS:

1. Laub & Collins, Somerset, Pa. (contract) $608,621
2. H. J. Williams Co., Inc., York, Pa. 647,591
3. B. C. Banks Constr. Co., Wilkes-Barre, Pa. 677,982
4. A. B. Cole, Meshoppen, Pa. 770,478

Item	Quan.	Unit Pa... (1)	(2)	(3)
1. Clearing and grubbing	L.S.	$8,000.00	$7,500.00	$12,500.00
2. Class 1 excavation	240,260 c. y.	.75	.75	.95
3. Class 2 excavation	7,303 c. y.	2.50	4.00	3.00
4. Borrow excavation	316,510 c. y.	.45	.60	.52
5. Subgrade	6,032 s. y.	.25	.20	.15
6. Shoulders	1,520 l. f.	.40	.30	.25
7. Cement concrete paving, 9-in.	6,032 s. y.	4.00	3.30	3.33
8. Bit. wear. surf., HE-T for bridge floors (top crse. matl.) excl. seal coat	15 ton	15.00	11.00	9.00
9. Bit. surf. crse., HE-T, excl. seal coat	51 ton	15.00	11.00	9.00
10. Seal coat for bit. surf. crse. HE-T.	277 s. y.	1.50	.30	.25
11. Class A concrete	138 c. y.	40.00	35.00	27.00
12. Class B concrete	6,517 c. y.	22.50	23.00	25.50
13. Cl. B concrete for (encasement)	159 c. y.	22.50	24.00	30.00
14. Class B concrete for (divisor)	19 c. y.	22.50	24.00	25.00
15. Ties for tie grillage	76 ea.	3.00	3.00	3.00
16. Stone backfill, structures	334 c. y.	5.00	4.00	5.00
17. Timber test piles (4 per ea. 32-ft.).	L.S.	2,500.00	1,300.00	1,000.00
18. 32-ft. timber piles	224 l. f.	1.00	.90	1.25
19. 26-ft. timber piles	156 l. f.	1.25	.90	1.15
20. 20-ft. timber piles	380 l. f.	1.50	1.00	1.10
21. 14-ft. timber piles	392 l. f.	1.50	1.00	1.10
22. Cement rubble masonry	63 c. y.	25.00	24.00	20.00
23. Pressure grout surface	726 s. y.	5.00	4.50	5.25
24. Cl. B cem. conc. pavmt. for stream beds, 6-in. deep	36 c. y.	17.50	35.00	18.00
25. Type E inlets	5 ea.	150.00	125.00	150.00
26. Type F inlet	1 ea.	250.00	135.00	175.00
27. 18-in. vit. clay pipe (to be encased).	58 l. f.	3.75	4.00	8.00
28. 24-in. vit. clay pipe (to be encased).	202 l. f.	5.50	5.50	14.10
29. 30-in. vit clay pipe (to be encased).	106 l. f.	7.00	9.50	9.00
30. Plain cem. conc. pipe, 42-in. (encased)	148 l. f.	11.00	12.00	11.50
31. 15-in. triple strength vit. clay pipe.	904 l. f.	3.25	4.00	3.50
32. 18-in. as above	734 l. f.	3.75	5.00	4.00
33. 24-in. as above	794 l. f.	5.50	7.00	5.50
34. 30-in. as above	368 l. f.	7.00	12.00	8.00
35. 4-in. tile underdrain	3,000 l. f.	1.00	1.00	.80
36. 6-in. tile underdrain	500 l. f.	1.10	1.20	.90
37. Stone found. underdrain, Type A	2,000 l. f.	.90	.50	.60
38. 4-in. tile outlet	300 l. f.	.90	.80	.70
39. 6-in. tile outlet	50 l. f.	.90	1.00	.80
40. Plain cem. conc. curb and gutter, type C	343 s. y.	4.50	4.00	4.00
41. Straight stone curb, type A	801 l. f.	3.50	3.25	3.00
42. Curved stone curb, type A	144 l. f.	4.50	5.00	4.00
43. Reset curb	1,345 l. f.	1.25	2.50	1.10
44. Redressed, reset stone curb	264 l. f.	2.00	3.70	1.25
45. Place plain steel bars	L.S.	4,155.00	1,500.00	2,500.00
46. Place salvaged struct. steel	L.S.	25,000.00	10,000.00	8,000.00
47. Lumber	14 Mbm.	350.00	130.00	160.00

BRIDGE, GEORGIA

OWNER: Georgia State Highway Department, Atlanta; W. E. Wilburn, chairman.

PROJECT: Construction of reinforced concrete bridge over the Chattahoochee River in Fulton and Cobb Counties, Ga., on the Atlanta-Marietta Road. Length of project 701 feet; roadway width 26-ft., with 5-ft. concrete sidewalk on one side. Height above normal water level is 40-ft.

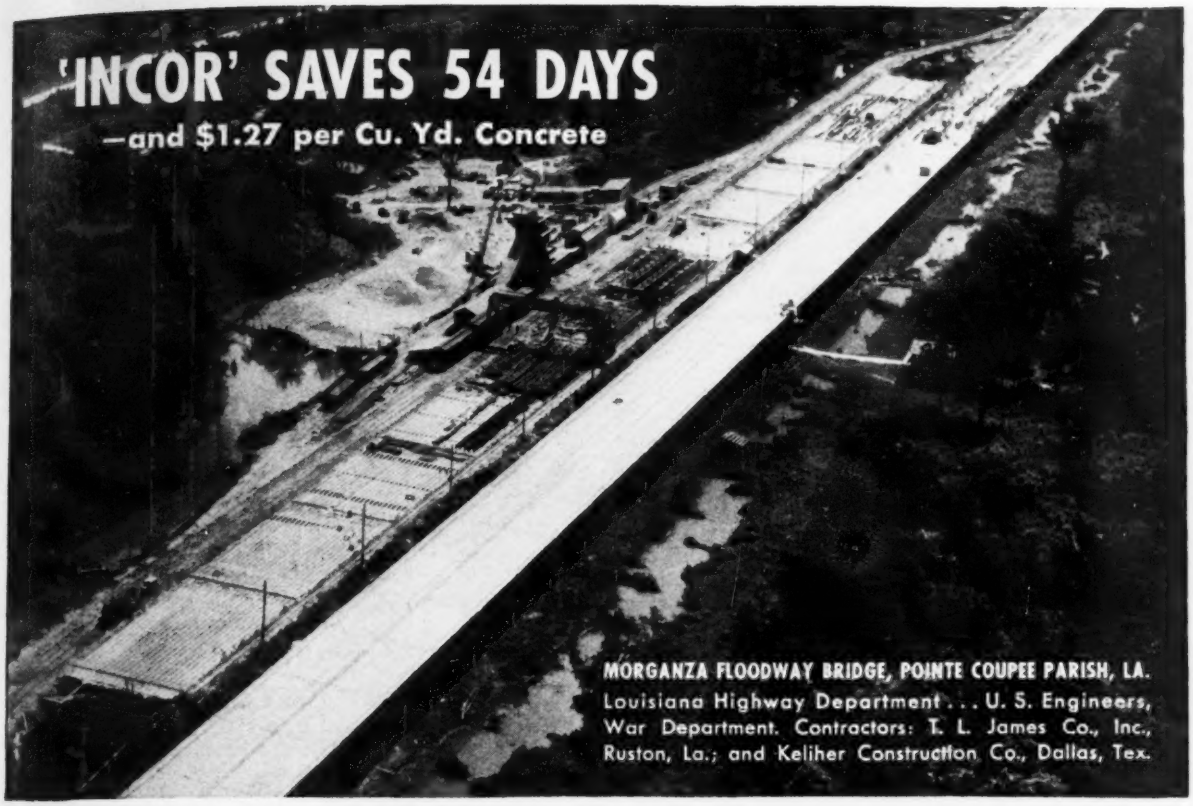
CONDITIONS: Contractor to furnish all materials and complete work by December 1, 1942. Railway transportation facilities available three miles from site of work, and highway at the project. Wage rate minimums are: skilled labor, 50c. per hour; semi-skilled, 40c; and common, 30c.

BIDS: Five bids were received July 3, 1942, ranging from the contract low of $201,466 to $239,958.

LIST OF BIDDERS:

1. G. L. Strickler, Austell, Ga. (contract) $201,466
2. W. B. Brantley Constr. Co., Atlanta, Ga. 206,477
3. H. G. Smith, Fitzgerald, Ga. 210,906
4. Southeastern Engineering Co., Atlanta, Ga. 229,566
5. S. B. Slack, Decatur, Ga. 239,958

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Class A concrete	3,200 c. y.	$40.00	$38.75	$34.00
2. Bar reinforcing steel	282,000 lb.	.065	.07	.07
3. Structural steel	L.S.	2,000.00	2,500.00	2,000.00
4. Excavation, No. 1	3,700 c. y.	10.00	12.00	17.00
5. Excavation, No. 2	400 c. y.	2.50	7.00	20.00
6. Concrete handrail	1,404 l. f.	4.00	3.50	1.50
7. Clearing and grubbing (3.222 ac.)	L.S.	2,000.00	1,000.00	700.00
8. Excavation	1,000 c. y.	1.00	.75	1.00


'INCOR' SAVES 54 DAYS
—and $1.27 per Cu. Yd. Concrete
MORGANZA FLOODWAY BRIDGE, POINTE COUPEE PARISH, LA.
Louisiana Highway Department . . . U. S. Engineers, War Department. Contractors: T. L. James Co., Inc., Ruston, La.; and Keliher Construction Co., Dallas, Tex.

SELECTIVE USE OF LONE STAR AND 'INCOR' PRODUCES TOP SPEED AT MINIMUM COST

TOP-SPEED construction of this 3½-mile-long concrete pile trestle, carrying U. S. Highway 190 over Morganza Floodway in Pointe Coupee Parish, La., drives home the advantages of selective use of Lone Star Cement and 'Incor' 24-Hour Cement. This structure, providing a 50-ft. clear roadway, consists of 458 41-ft. concrete deck girder spans, carried on concrete piles 2 ft. square and 85 ft. long, with precast pile caps. Total concrete, 100,000 cu. yds.

Casting the 51 miles of piling for this job, in a yard built over bottomless swamp, presented difficult problems of plant layout and size. After cost studies, contractors selected 'Incor' for piling because its dependable high early strength saved 18 days on each pour . . . permitted fast, line-production schedules for casting and driving, with a casting yard only 1/3 the size needed with ordinary cement . . . advanced completion by 54 days. *Resulting net savings on yard construction, curing and overhead costs: $1.27 per cu. yd. of concrete.*

Lone Star was used on the rest of the job, where it in turn showed the lower concreting cost. The combination of 'Incor'* in the substructure and Lone Star in the deck paced this job to earliest completion—quality concrete at top speed and minimum cost. That's selective concreting . . . and it pays on every job! *Reg. U. S. Pat. Off.

LONE STAR CEMENT CORPORATION

Offices: ALBANY • BIRMINGHAM • BOSTON • CHICAGO • DALLAS • HOUSTON • INDIANAPOLIS • JACKSON, MISS. KANSAS CITY • NEW ORLEANS • NEW YORK • NORFOLK • PHILADELPHIA • ST. LOUIS • WASHINGTON, D. C.

LONE STAR, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS . . 15 MODERN MILLS . . 25-MILLION BARRELS ANNUAL CAPACITY

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

LUMBER PRICES showed the only major change in the construction material and labor list with mixed price trends prevailing. Southern pine was up $1.00 to $4.00 on most sizes in Baltimore; up $2.00 on 1- and 2-in. sizes in New York, and on all sizes in Philadelphia; but off $1.00 to $2.00 in Chicago; and down $2.00 to $2.50 on 1- and 2-in. sizes in Detroit. Douglas fir was up $4.00 in Baltimore on 2-in.; and up $1.00 to $3.00 in Chicago.

Common brick rose $1.00 per M in Baltimore, but declined $1.50 in Boston, and 50c. in Kansas City. Cement was up 3c. per barrel in Baltimore. Sand was down 65c. per ton in Dallas, and gravel was 25c. to 30c. per ton lower there. Gravel, however, increased 25c. in St. Louis on the 1½-in. size. Reinforcing steel bars climbed in Detroit and St. Louis, and cast iron pipe was higher in all of the cities due to increased shipping costs.

Hoisting engineers' rate in Dallas, which ranged from $1.25 to $1.50 per hour, has increased to $1.75. Structural ironworkers' wage in Baltimore is $1.80, and the hoisting engineers' rate there now ranges from $1.625 to $1.80 per hour.

CEMENT, AGGREGATES, READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT — Per bbl., carload lots, including 40c per bbl. for bags, cash discount not deducted			SAND AND GRAVEL — Per ton, carload lots			CRUSHED STONE — Per ton, carload lots		CRUSHED SLAG — Per ton, carload lots, f.o.b. plant		CONCRETE — Ready Mixed 1:2:4, 50 c.y. or more, delivered
	Cloth Bags *a*	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	
Atlanta	$2.77	$2.52	$2.47	$1.79	$1.89	$1.99	$1.79	$1.89	$1.59	$1.69	$8.04
Baltimore	2.33	2.08	1.88	1.75‡	1.75‡	1.25‡	1.75‡	1.75‡	1.75‡	1.75‡	7.25
Birmingham	2.50	2.25	....	1.75	1.75	1.50	.85	1.00	.90	1.15	5.80
Boston	2.75*b*	2.50*b*	2.30	1.40‡	1.40‡	1.00‡	1.40‡	1.40‡	....	....	7.25*m*
Chicago	2.70	2.45	2.30	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	1.75‡	1.75‡	....
Cincinnati	2.31	2.06	1.81	1.20	1.20	1.10	1.80	1.80	....	....	6.60
Cleveland	2.39	2.14	....	1.50*i*	1.50*i*	1.30*i*	1.75*i*	1.75*i*	1.75*i*	1.75*i*	7.30*i*
Dallas	2.52	2.27	2.07	1.50*p*	1.70*p*	1.10*p*	1.69*p*	1.79*p*	....	....	6.20
Denver	3.08	2.88	....	1.20	1.45	.90	....	....	....	....	7.25
Detroit	2.40	2.15	1.95	2.25	2.00	1.10	2.25	2.25	2.00‡	2.00‡	6.50
Kansas City	2.58	2.33	2.18	1.85	2.30	1.00	1.91	1.91	....	....	7.50*n*
Los Angeles	2.80*o*	2.20*o*	....	1.20	1.20	1.15	1.20*f*	1.20*f*	....	....	6.65
Minneapolis	2.90	2.65	....	1.00*k*	1.00*k*	.25*k*	1.00*k*	1.00*k*	....	....	7.35*j*
Montreal	....	1.95*rs*	1.79*rs*	....	....	1.25‡*t*	1.20‡*ct*	1.30‡*ct*	....	....	7.90*s*
New Orleans	2.41	2.16	1.96	1.65	1.65	.90	....	....	....	....	9.25
New York	2.66‡	2.41‡	....	1.60*de*	1.60*de*	.90*de*	1.70*ds*	1.80*ds*	....	....	7.25*k*
Philadelphia	2.32	2.07	1.87	1.55‡	1.65‡	1.20‡	1.90	1.95	1.10	1.10	8.20
Pittsburgh	2.44	2.19	1.99	1.40‡	1.40‡	1.70‡	2.25‡	2.25‡	1.50	1.50	8.25
St. Louis	2.80	2.52	....	1.75‡	1.50‡	1.25/1.50‡	1.10*h*	1.10*h*	.75*g*	.75*g*	8.00
San Francisco	....*u*	2.21	1.81	1.36	1.36	1.36	1.46	1.46	....	....	7.55
Seattle	2.95*o*	2.75*o*	....	1.00*o*	1.00*o*	1.00*o*	2.00*o*	2.00*o*	....	....	7.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* Plus municipal tax. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount of 25c per. c. y. for cash in 10 days. *l* Up to 200 cu. yd. *m* 50c. off for cash *n* 25 c.y. or more *o* 2% off for cash. *p* 10c. per ton off, cash 15 days. *r* 10c. per bbl. off, cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u*. Price withdrawn. *v* 20c. per bbl. discount; 20c. allowed for returnable cloth bag.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind	$1.70	$1.65	Ironton, Ohio	$1.60	$1.55	Richard City, Tenn	$1.80	$1.75
Dallas, Tex. (Inc. 10c. tax)	1.85	1.80	Limedale, Ind	1.70	1.65	Steelton, Minn	1.80	1.75
Hannibal, Mo	1.70	1.65	Norfolk, Va	1.75	1.70	Universal, Pa	1.65	1.60
Hudson, N. Y	1.75	1.70	Northampton, Pa	1.55	1.50	Waco, Tex. (Plus 10c. tax in Tex.)	1.75	1.70
Independence, Kans	1.70	1.65	North Birmingham, Ala	1.70	1.65	Montreal (8% sales tax incl.)	1.68	1.67

PAVING BRICK, BLOCKS, ASPHALT, ROAD OILS—F.O.B. CITY

	PAVING BRICKS AND BLOCKS — Granite per M. lots of 50,000 4x4x8 in.	Brick per M. 3x4x8½ in. carload lots	Wood per sq. yd. 3½ n. 16-lb. treat	PAVING ASPHALT — Per ton, less than 80 penetration: Tank car	Drums	ASPHALT BINDERS—FLUXES — Per gal., 80-300 penetration: Tank car	Drums	CUTBACK ASPHALT — Per ton: Tank car	Drums	ROAD OILS — Per gal.: Tank car	ASPHALT EMULSION (Quick-breaking) Per gal.: Tank car	Drums
Atlanta	$73.00	$39.35	$2.25	$18.40*e*	$24.62*e*	$0.0787*e*	$0.1309*e*	$0.0826*he*	$0.1348*h*	$0.0676*e*	$0.0826	$0.1384
Baltimore	150.00‡	45.00‡	80.00*m*	15.00	21.00	.06	.09	13.00	23.00	065	.07	.14
Birmingham	.....	32.00*j*	....	17.95	.....†	.0747	.....†	.0834*h*	.....†	.065	.09	.....†
Boston	85.00	55.00	3.75	14.00	20.00	.06	.09	.065*h*	.115*h*	.065	.09‡	.12‡
Chicago	150.00	55.00	2.20*d*	14.80	20.80	13.00*g*	18.50*g*	.0625*h*	.15*h*	.05*n*	.08	.12/.14
Cincinnati	112.00	37.50	....	16.40	.....	.085	.....	12.25	.....	.07	.085	.....
Cleveland	110.00	38.50	2.25	20.00	25.00	.09	.155	.10*h*	15.00	.07	.11	.15
Dallas	.....	36.00	....	13.25	20.30	.06	.11‡	16.00	24.80	.06	.05/.07	.07/.09
Denver	.....	27.50	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	37.50	....	15.10*f*	22.60*f*	.0725	.1262	15.10	21.10	.067	.0725	.1262
Kansas City	.....	40.00	....	18.50	23.50	.077	.1075	.077*h*	.107*h*	.057	.11	.15
Los Angeles	.....	50.00	....	6.50*b*	15.00	6.50*bg*	15.00*bg*	5.50*b*	.....	.0192	.0525	.1125
Minneapolis	.....	.....	1.87*d*	.....	27.70	.....	.126	.....	32.64	.....	.....	.....
Montreal	.....	.....	....	16.60*k*	24.25*k*	.116*k*	.1485*k*	.115*hk*	.135*hk*	.08*k*	.135*k*	.188*k*
New Orleans	.....	.....	....	13.00*a*	19.00*a*	.055	.085	.06*h*	.09*h*	.....	.078	.....
New York	.....	.....	....	16.40	23.50	.064	.124	.07*h*	.13*h*	.0675	.0725	.1225
Philadelphia	130.00	58.00	3.96	14.00	.....	.055	.....	.065*h*	.....	.055	.065	.....
Pittsburgh	135.00	38.75	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis	.....	37.00	....	15.00*n*	21.00*n*	14.00*gn*	20.00*gn*	.065*hn*	.11*hn*	.05*n*	.09*n*	.8125*n*
San Francisco	.....	70.00	....	9.50	18.00	9.50*g*	18.00*g*	10.00	17.50	9.50*g*	.0525	.1125
Seattle	.....	60.00*c*	....	9.50*i*	25.85	.....	25.10*g*	10.00*i*	.....	9.50*i*	.0575*i*	.008*i*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½x4x8½ in. *d* 2½ in. 12-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican. *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3x3½x8½ in. *k* Tax included. *m* Per thousand. † Available on priority only and quoted specially. *n* September price, none later available.

Oh, the North Countree is a hard countree,
And it's tough on Diesel oil—
But hark while we chant of a cold storage plant
(Where you keep things, lest they spoil).

Back in April, 'Forty—yes, 1940—
A big six-cylinder Dies'
Went to work with a will, creating a chill—
Its motto: "I aim to freeze."

Oh, the North Countree is a hard countree,
And a year is twelve months long;
Yet, it's perfectly true that in March,'42,
This Diesel still ran like a song!

Oh, oil-buyers wary, oh oil-buyers chary,
You can see that the moral is clear:
Your Diesel runs swell-o on RPM DELO
And does so for many a year!

EVER since the Marshfield Cold Storage Company of Marshfield, Wisconsin, installed its International UD-18 6-cylinder, 108-H.P. Diesel in April, 1940, the engine has been lubricated exclusively with RPM DELO. It has had 10,000 hours of continuous operation—and here are the results:

When the engine was thoroughly overhauled last March, cylinders showed less than .0035 inch maximum wear, pins were all tight and showed less than .002 inch wear, rod bearings were in "exceptionally fine condition." No wonder the company says, "we are indeed happy we selected RPM DELO as our lubricant and would not hesitate to highly recommend it."

STANDARD OIL COMPANY OF CALIFORNIA

RPM DELO

RPM DELO is marketed under the following names:
RPM DELO · Caltex RPM DELO · Kyso RPM DELO
Signal RPM DELO · Imperial-RPM DELO · Sohio RPM DELO
CONCENTRATE
Ask your Diesel engine manufacturer or distributor for the RPM DELO supplier in your vicinity

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ½-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton: Standard	Light	Re-rolled	TRACK SUPPLIES: Angle Bars	Std. Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.10	$2.15	$3.75	$2.55	.....	$40.00	$40.00	$39.00	$2.70	$3.00	$2.15	$4.75
Chicago	2.10	2.15	3.75	2.55	$2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Pittsburgh	2.10	2.15	3.75	2.55	2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Buffalo	2.10	2.15	.....	.....	2.40	.....	.....	.....	.....	.....	2.15	.....
Cleveland	2.10	2.15	3.75	2.55	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown	.....	2.15	.....	.....	.....	.....	.....	.....	.....	3.00	.....	.....
Detroit	.....	2.27‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gulf ports	2.47*a*	2.52*a*	.....	.....	2.85*a*	.....	.....	.....	.....	.....	.....	.....
Pacific ports	2.75*a*	2.80*a*	.....	.....	2.95*a*	.....	.....	.....	.....	.....	2.30	.....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates, alone; Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per ad.

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS* Per 100 lb., ¾ in., base price: 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH Per 100 sq.yd., carload lots: Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 s.f., carload lots: 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per sq. yd.	SHEET PILING Per 100 lb. base price
Atlanta	$2.34	$2.39	$2.39	$.02½	$.10	$21.06	$23.00	1.82	1.35	$0.1719	$3.04
Baltimore	3.70	2.90	2.75	.....	.10	22.50	24.50	1.70	1.27	.1611	3.09
Birmingham	2.10*a*	2.15	2.15	.02½	.10	19.00	21.00	1.80	1.34	.1701	.....
Boston	3.85	3.51	3.36	$20 C.L.	.10	18.50	29.50	1.76	1.31	.1656	2.70
Chicago	2.10*a*	2.15	2.15	.03	.05	21.50	23.50	1.67	1.25	.1575	2.40
Cincinnati	3.68	2.53*cd*	2.53*cd*	.....	.05	19.50	21.50	1.66	1.25	.1566	.....
Cleveland	2.10*a*	2.15	2.15	.02½	.10	19.50	21.50	1.66	1.25	.1566	.....
Dallas	4.25	3.17	3.17	.....	.....	25.00	27.50	1.93	1.42	.1827	.....
Denver	4.35	3.95	3.85	.....	.....	26.50	28.50	1.97	1.45	.1863	.....
Detroit	3.65‡	2.52‡	2.52‡	.....	.10	23.00	25.00	1.68	1.26	.1584	2.66
Kansas City	4.00	2.64*cd*	2.64*cd*	.0	.05	19.60	23.60	1.78	1.33	.1683	2.89
Los Angeles	3.65*f*	3.32	3.32	.02½	.05	23.00	27.50	1.93	1.42	.1827	3.65
Minneapolis	3.80‡	2.75	2.75	.0	.10	25.00	27.00	1.80	1.34	.1701	2.75*d*
Montreal	4.00*i*	2.90*i*	2.80*i*	.....	.....	26.00*hij*	33.00*hij*	2.56*i*	3.14*i*	.2684	.....
New Orleans	4.40	2.52	2.52	.05	.10	21.50	23.50	1.82	1.35	.1719	2.87*d*
New York	3.75	2.76*c*	2.76*c*	.....	.15	17.50	19.50	1.76	1.32	.1665	2.74
Philadelphia	3.65	3.85	....	.....	.....	19.50	21.50	1.71	1.28	.1611	2.74
Pittsburgh	2.10*a*	2.15	2.15	.02½	.10	23.00	26.50	1.59	1.20	.1503	2.40
St. Louis	3.69	2.75	2.75	.0	.05	28.00	34.00	1.69	1.27	.1602	2.70
San Francisco	4.35	2.825	.....	.02½	.10	21.00	24.50	1.93	1.42	.1827	3.85
Seattle	2.75*e*	2.50*e*	.....	.....	.....	34.50	38.50	1.93	1.42	.1827	2.95*d*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 25c.; 1 to 5 tons, add 10c. * High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax. *j* August price; not on market.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in.*a*	VITRIFIED SEWER PIPE: Per foot, std. 8 in., s.s.	delivered std. 12 in., s.s.	ASTM C13–35 24 in.,	36 in.,	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b.: 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM C 14–35: 12 in.	24 in.	WROUGHT STEEL PIPE Full standard weight, *k*: 1 to 3 in., Butt Weld Black %	Galv. %	3½ to 6 in.; Lap Weld Black %	Galv. %
Atlanta	$49.66	$0.26*b*	$0.468*bc*	$1.8525	$4.68*c*	$85.00	$128.00	$0.45	$1.642	48.2	54.2	59.7	51.2
Baltimore	53.00	.35	.60	2.65	7.25	160.00	200.00	.50	1.75	65.5	57.5	63.0	54.5
Birmingham	45.00	.275	.495	1.95	5.50	100.00	220.00	.50	1.70	62.2	54.2	59.7	51.2
Boston	55.40	.26	.463	2.07	5.85	140.00	.....	.70	....	64.1	56.1	61.6	53.1
Chicago	54.33	.35	.675	2.70	7.00	100.00‡	150.00‡	.45	1.85	62.2	54.2	59.7	51.2
Cincinnati	53.27	.231	.4455	1.80	5.125	105.00	170.00	.60	1.70	65.9	57.9	63.4	54.9
Cleveland	54.75	.203	.3915	1.665	5.125	81.00	125.00	.30	1.60	67.8	59.8	65.3	56.8
Dallas	56.43	.31	.58	2.25	5.00	90.00	110.00	.46	1.57	59.9	51.9	57.3	48.3
Denver	61.56	.29†	.52†	2.16†	....	130.00	240.00	....	....	58.4	50.4	55.7	47.2
Detroit	54.75	.245	.4725	1.935	5.14	82.50	131.25	.35	1.50	66.3	58.3	63.8	55.3
Kansas City	55.73	.315	.39	2.20	5.86	140.00	260.00	.45	1.60	62.9	54.9	60.0	51.5
Los Angeles	68.40	.282†	.508†	2.034†	5.085†	115.50	192.50	1.00	2.00	59.6	51.6	57.0	48.6
Minneapolis	57.83	.275†	.495†	1.98†	5.14†	.....	.....	.90	2.10	64.2	56.2	60.7	52.2
Montreal	60.00	.85	1.50	5.25	8.50*e*	45.00*m*	64.00*m*	.48*m*	1.92*m*	....	....	....	....
New Orleans	51.78	.26	.48	1.69	.....	150.00	220.00	.40	2.10	62.4	54.4	58.8	50.3
New York	52.40	.455	.8775	2.925	7.65	.....	.....	.60	1.40	64.9	56.8	62.4	53.9
Philadelphia	51.00	.28	.54	2.30	6.75	150.00	225.00	.45	1.75	56.4	42.6	53.3	38.9
Pittsburgh	56.00	.245†	.4725†	1.845†	5.4325	97.80	154.20	.85*g*	2.00*g*	68.5*i*	57.5*i*	66.0*i*	54.5*i*
St. Louis	52.84	.28	.504	2.016	4.50	85.00	220.00	1.00*j*	1.50*k*	56.4	42.6	52.5	38.1
San Francisco	68.40	.3625*d*	.6525*d*	2.61	6.52	115.50	192.50	.58	3.30	46.0	32.0	42.0	27.0
Seattle	70.20	.375	.675	2.70	6.75	84.00	187.50	.51*f*	1.44*f*	....	....	....	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N.J. (base) $49.00. Based on existing freight rates; subject to rate change. Gas pipe and class A, $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¾ in., 8½c.; ¾ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base: Butt-weld—1 in. and 1¼ in. black 34, galv. 16; 1½ in. black 38, galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½, galv. 14½; 4½ in. to 8 in. black, 32½ galv. 17. *j* Reinforced; spec. C 76-37. *k* Reinforced; spec. C 75-37. *l* Plus sales tax. *m* Tax included.

LUMBER, TIMBER PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face) — *All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)*									LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD Rail freight increment (See note for base price	
	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 R2h	6x12 R2h	12x12 R2h	2x12 R2h	12x12 R2h	5/16"	3/4"
Atlanta	**$29.00**	**$28.00**	**$29.00**	**$27.00**	**$28.00**	**$29.50**	**$40.00**	.....	.....	$60.00	$70.00	$17.90	$21.85
Baltimore	**40.00**	**42.00**	**40.00**	**40.00**	**41.00**	**44.00**	**60.00**	.....	.....	110.00	115.00	18.25	22.25
	46.00	*46.00*	*52.00*	*52.00*	*52.00*	*52.00*	*68.00*	*$70.00*	*$72.00*	.....	.....	.....	.....
Birmingham	**34.50**	**34.50**	**32.00**	**32.00**	**32.00**	**34.00**	**53.00**	**53.00**	**56.00**	.....	.....	17.35	21.15
[3]	37.50	37.50	37.00	37.00	37.00	43.00	65.00	.....	.....	67.50	70.00	.....	.....
Boston ‡*	70.00[3]	70.00[3]	60.00[3]	60.00[3]	87.00[1]	100.00[1]	115.00[1]	.....	.....	115.00	130.00	18.25	22.25
‡*	*55.00*	*55.00*	*60.00*	*65.00*	*65.00*	*80.00*	*85.00*	*85.00*	*85.00*	.....	.....	.....	.....
Chicago	**42.00**	**43.00**	**41.00**	**40.00**	**41.00**	**42.50**	**60.00**	.....	.....	80.00	95.00	14.60	17.80
	46.00	*46.00*	*47.50*	*47.00*	*47.00*	*48.00*	*57.00*	*56.50*	*56.50*	.....	.....	.....	.....
Cincinnati	**41.00**	**42.50**	**39.00**	**40.50**	**42.00**	**43.00**	**53.00**	.....	.....	65.00	68.00	17.35	21.15
	.....	.....	.....	.....	.....	.....	*55.50*	*55.50*	*55.50*	.....	.....	.....	.....
Cleveland	**42.50**	**43.50**	**41.50**	**43.50**	**45.00**	**47.00**	**53.00**	57.00	57.00	90.00	93.00	17.75	21.60
Dallas *e*	**39.50**	**40.50**	**39.50**	**38.00**	**38.50**	**39.50**	**53.00**	**53.00**	**53.00**	78.00	83.00	14.60	17.80
Denver ‡	54.00[4]	52.00[4]	55.00[4]	55.00[4]	55.00[4]	56.00[4]	59.00[4]	*73.00*	*79.00*	.....	.....	10.45	12.70
Detroit	**44.00**	**44.00**	**44.00**	**43.50**	**44.00**	**46.00**	**60.00**	.....	.....	53.00	63.00	17.35	21.15
	.....	.....	.....	.....	.....	*51.50*	*55.00*	*60.00*	*60.00*	.....	.....	.....	.....
Kansas City	**50.00**	**55.00**	**52.00**	**52.00**	**52.00**	**55.00**	**65.00**	.....	.....	75.00	85.00	12.60	15.40
	60.00	*55.00*	*52.00*	*52.00*	*52.00*	*55.00*	*65.00*	*80.00*	*80.00*	.....	.....	.....	.....
Los Angeles *a*	*55.00*	*55.00*	*53.00*	*53.00*	*51.00*	*51.00*	*57.00*	*65.00*	*66.00*	.....	.....	9.90*g h*	12.05*g h*
Minneapolis ‡*b*	49.00[3]	49.00[3]	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.60	15.40
‡	*55.00*	*55.00*	*53.00*	*52.00*	*52.00*	*53.00*	*59.00*	**61.00**	**61.00**	.....	.....	.....	.....
Montreal ††	*48.00*	*46.00*	*48.00*	*48.00*	*47.00*	*54.00*	.....	.....	.....	200.00	200.00	.....	.....
	48.50	*48.50*	*48.95*	*47.25*	*48.25*	*46.75*	*50.75*	**50.75**	**50.75**	.....	.....	.....	.....
New Orleans	**31.50**	**31.50**	**33.75**	**31.75**	**34.00**	**35.00**	**48.00**	.....	.....	69.00	69.00	14.60	17.80
	31.00	*31.00*	*33.00*	*31.00*	*34.00*	*32.00*	*33.00*	.....	.....	.....	.....	.....	.....
New York ‡	**50.00**	**51.00**	**51.00**	**50.00**	**51.00**	**54.00**	**62.00**	.....	.....	120.00*f*	125.00*f*	18.35	22.25
‡	.....	.....	*65.00i*	*65.00i*	*65.00i*	*65.00i*	Range from $75 to $95			.....	.....	.....	.....
Philadelphia	**48.00**	**49.00**	**48.00**	**48.00**	**49.00**	**52.00**	**54.00**	.....	.....	82.00	87.00	18.25	22.25
	54.00	*54.00*	*65.00*	*65.00*	*65.00*	*65.00*	*67.50*	*75.00*	*75.00*	.....	.....	.....	.....
Pittsburgh	**50.80**	**53.20**	**62.75**	**55.00**	**60.85**	**62.50**	**76.25**	.....	.....	.....	.....	18.10	22.05
	69.20	*68.10*	*66.10*	*65.30*	*65.20*	*65.65*	*88.75*	*88.75*	*88.75*	.....	.....	.....	.....
St. Louis ‡*c*	**49.00**	**49.00**	**46.50**	**45.50**	**47.50**	**50.00**	**64.50**	*71.00*	*71.00*	81.00	70.00	14.60	17.80
San Francisco *d*	*55.50*	*55.50*	*57.00*	*57.00*	*56.50*	*56.50*	*40.50*	*49.50*	*49.50*	.....	.....	7.30*g*	8.90*g*
Seattle	*55.00*	*55.00*	*55.00*	*55.00*	*55.00*	*55.00*	*40.00*	*40.00*	*40.00*	.....	.....	0.00	0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers' N. C. Pine. [3] Spruce. [4] Native. [5] Western Pine, No. 3 Common. [7] Spruce. [8] Norway Pine. ‡ Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* F.o.b. cars San Francisco freight rate. *e* 10% discount taken off. *f* Up to 18 ft. † Plus sales tax. * Prices for truck delivery; no longer quoting carload lots f. o. b. city.

NOTE: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on 5/16", $86.50; on 3/4", $95.30; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M. *g* Lower rate by water shipment. *h* 50,000 lb. minimum. *i* Ranges from $65 to $69.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Aug. 15, 1938 Single or Double Thickness A quality	B quality	EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots*
Atlanta	75%	75%	$0.15
Baltimore	78%	79%	.15
Birmingham	76%	76%	.105
Boston	77%	78%	.15
Chicago	77%	77%	.15
Cincinnati	77–10%	77–10%	.15
Cleveland	77%	77%	.19
Dallas	76%	76%	.1625
Denver	76%	76%	.155*e*
Detroit	77%	77%	.15
Kansas City	76–10%	76–10%	.155
Los Angeles	86%*d*	88%*d*	.1575
Minneapolis	77%	77%	.155
Montreal	40–5%‡	47%‡	.1675†
New Orleans	70%	75%	.16
New York	81%	82%	.22*f*
Philadelphia	78%	79%	.15
Pittsburgh	79%	79%	.1225
St. Louis	76–10%	76–10%	.155
San Francisco	66–15%	73–15%	.155
Seattle	75%	75%	.1575†

Price of 60% Ammonia Gelatin in $0.01 per lb. higher than 40%

a Disc. from list Sept. 1939. *b* Also less 6% tax exemption. *d* Discount from jobbers' list Sept. 15, 1928. ‡ Plus sales tax.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal Street, add delivery charge of $6.00 per trip. † F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine.	.11 –.1175	.135 –.1475	.155 –.1675
Rocky Mtn. States	.11 –.1225	.135 –.1525‡	.155 –.1725‡
Pacific N. W. States	.1075–.12	.1375–.15	.1575–.17
Pacific S. W. States	.1050–.1125	.135 –.1425	.155 –.1625

‡ F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES — F. O. B.

PILES

Prices per linear foot, pine, with bark on, f.o.b. New York; delivered from barge 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Barge	Leaf Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.23	$0.26
12 in.— 2 ft. from butt	6 in.	50 to 59 ft.	.26	.28
12 in.— 2 ft. from butt	6 in.	60 to 69 ft.	.31	.33
14 in.— 2 ft. from butt	6 in.	50 to 69 ft.	.28	.33
14 in.— 2 ft. from butt	6 in.	70 to 79 ft.	.31	.37
14 in.— 2 ft. from butt	5 in.	80 to 85 ft.	.40	.48
14 in.— 2 ft. from butt	5 in.	85 to 89 ft.	.45	.53

RAILWAY TIES

Prices f.o.b., per tie for carload lots:		6"x8"x8' Untr.	6"x8"x8' Tr.	7"x9"x8'6" Untr.	7"x9"x8'6" Tr.
Boston	Oak	$1.30	....	$1.80	....
	Pine	1.60	$2.40*a*	2.40	$3.40*a*
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76	2.86
	Mixed Oak	1.71	2.59	2.20	3.25
Birmingham	White Oak	1.00	1.60*a*	1.30	2.25*a*
	Southern Pine	....	....	....	....
Chicago	Red Oak	....	2.40*a*	....	3.00*a*
	Southern Pine	....	....	....	....
Los Angeles	Douglas Fir	1.10	1.75*a*	1.60	2.50*a*
Philadelphia	Red Oak	....	2.10*a*	....	3.25*a*
St. Louis	White Oak	1.65*	....	1.90*	....
	Red Oak	1.55*	2.15*a**	1.90*	2.70*a**
	Sap Pine or Cypress	1.35*	....	1.70*	....
San Francisco	Douglas Fir	1.15*bef*	....	....	3.00*caf*
Montreal	Birch or Maple	.85	.95	....†	....†

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 6" x 8 x 8'6". *c* Empty cell. *d* Zinc. *e* Green. *f* F. o. b. cars. † Out of market. * September price, none later available.

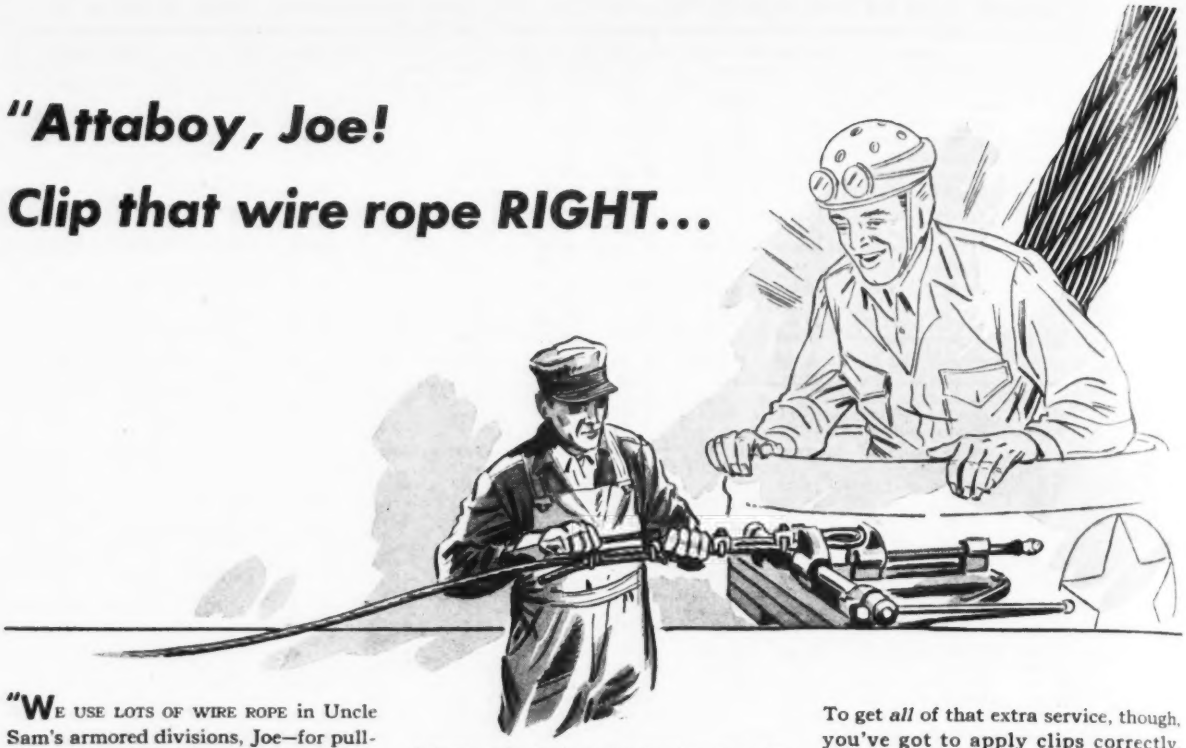
CHEMICALS

Water, sewage treatment road work, f.o.b. carlots, New York

Bleaching powder, in drums, f.o.b. works, per 100-lb	$2.25– 3.10
Chlorine cylinders, liquid, per lb. delivered	.0525
Calcium chloride, 77–80%, flaked, in 100-lb. paper bags, delivered, per ton	18.50–35.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00–25.00
Sulphate of copper, in bbl., per 100-lb	5.15– 5.50

"Attaboy, Joe!

Clip that wire rope RIGHT...



"WE USE LOTS OF WIRE ROPE in Uncle Sam's armored divisions, Joe—for pulling out of tight spots, for towing disabled tanks and trucks, for handling heavy replacement parts . . . And we use it right and *fasten* it right, because we know men's lives in battle may depend on its being just as strong as it's supposed to be!"

Keeping wire rope "just as strong as it's supposed to be" is important *wherever* wire rope is used—on fighting front or production front! One factor in rope strength is correct fastening. *Properly used,* clips make a convenient and satisfactory fastening, developing 75 to 90 per cent of the rope strength.

When we build "Blue Center" Steel Wire Rope here at Roebling, we put in all the *extra* value of 100 years of wire-rope engineering. But even "Blue Center" Steel Wire Rope can't give extra service unless *enough* clips are used in fastening. The table below gives data for clipping "Blue Center" Wire Rope.

NUMBER OF CLIPS REQUIRED FOR "BLUE CENTER" STEEL WIRE ROPES

Rope Diameter	Number of Clips	Spacing of Clips	Length of Wrench
1/2" to 5/8"	4	3 1/2" to 4 1/4"	12"
3/4" to 7/8"	5	5" to 5 3/4"	18"
1" to 1 1/8"	6	6 1/2" to 7 1/4"	24"
1 1/4" to 1 3/8"	7	8" to 8 3/4"	24"
1 1/2"	8	9 1/2"	24"

To get *all* of that extra service, though, you've got to apply clips correctly. Always use a standard wire-rope thimble. Put the clip U bolts on the dead end of the rope. Tighten bolts securely, but *do not crush rope!* Re-tighten all clips after an hour's full

running time and also at all regular inspections. By following these rules for proper clipping, you'll be helping to keep rope on the job for Victory.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY
Branches and Warehouses in Principal Cities

PROMPT SERVICE
on essential orders
from warehouse
stocks or mill

ROEBLING
"Blue Center"
STEEL WIRE ROPE
PREFORMED OR NON-PREFORMED

IRON AND STEEL ARE DESPERATELY NEEDED
Throw Your Scrap Into the FIGHT!

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE — PARTITION — SCORED Per M. lots of 2,000 pieces or over, 3x12x12 in.	4x12x12 in.	8x12x12 in.	STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over, 8x12x12 in.	10x12x12 in.	12x12x12 in.	BRICK Per M. in quantity, Common backing	Straight hard	LIME Per ton, Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized or lump
Atlanta	$104.00	$114.00	$199.00	$234.00	$244.00	$250.00	$13.50	$18.04	$26.54	$15.04	$15.04
Baltimore	84.00	90.00	170.00	200.00	260.00	320.00	15.00*k*	19.00*k*	18.00	13.00	2.50*m*
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	14.50	17.00	18.11	13.64	2.25*lo*
Ciston	89.35*a*	93.30*a*	178.70*a*	202.50	271.80	308.20	16.50*i*	19.50*i*	17.50*i*	12.50*i*	14.92*i*
Chicago	72.00	77.00	145.00	197.00	243.00	278.00	12.50	13.50	17.00	15.00	12.50
Cincinnati	65.55	69.90	131.20	148.70	210.35	240.45	17.50	17.50	15.50	13.00	.....
Cleveland	60.00	64.00	120.00	144.00	193.00	221.00	17.00	17.00	14.50*i*	13.25*i*	3.00*jm*
Dallas	62.50	67.00	135.00	162.00	212.50	263.00	13.50*i*	15.00*i*	19.00	15.00	.95*n*
Denver	84.80	94.40	152.70	178.20	212.00	227.90	13.50	17.50	30.00*j*	22.80*j*	24.00*j*
Detroit	76.90	81.50	152.80	201.00	262.00	310.00*e*	17.50	18.00	16.60	14.90	14.60
Kansas City	67.00	69.00	89.00*c*	128.00	163.00	189.00	15.00	16.00	19.32	13.00	10.92
Los Angeles	73.50*tr*	89.50*t*	128.00*ctr*	210.00*tr*	368.00*tr*	460.00*tr*	13.50	15.00	16.50	17.50	17.50
Minneapolis	81.00*b*	86.40*b*	146.90*b*	.....	177.00*b*	246.00*b*	13.60	15.60*g*	21.00	16.00	19.00
Montreal	99.10*a*	105.05*a*	154.75*a*	104.65*at*	154.75*au*	155.25	22.00*tu*	27.25*tu*	24.60*u*	18.00*u*	12.00*uv*
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08	14.10
New York	78.40	83.60	115.00*c*	193.30*h*	238.80*h*	295.60*h*	15.00	.....	20.00	14.00	17.00
Philadelphia	90.00	97.70	183.20	197.10	243.20	301.10	17.00	20.00	15.50	8.55	10.55
Pittsburgh	62.35	66.55	124.75	140.25	173.25	198.00	17.50	19.50	17.90	15.40	2.55*m*
St. Louis	67.00	95.00	130.00	190.00	244.00	290.00	18.00	17.00	22.00	18.00	18.00
San Francisco	84.00	94.50	225.00	.....	.....	.....	17.50	22.00	20.00	20.00	16.40
Seattle	105.00	115.00	210.00	.....	.....	.....	19.50*f*	20.50*f*	20.00*s*	20.00*s*	20.00*s*

† F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6x12x12 in. *d* Not load bearing. *e* 48 lb. tile. *f* Less $1.00, ½ cash 15 days, balance 30 days. *g* Selected common. *h* F.o.b. Perth Amboy, N. J. *i* F.o.b. Warehouse only. *j* LCL. *k* $1.00 discount if paid in 10 days. *l* Lump. *m* Per bbl., 180 lb. *n* Per sack 100 lb. *o* Per bbl., 200 lb. *p* 280 lb. bag. *r* 5% discount 10 days. *s* 2% discount for cash. *t* 5½x8x12. *u* Plus 8% sales tax. *v* August price; none later.

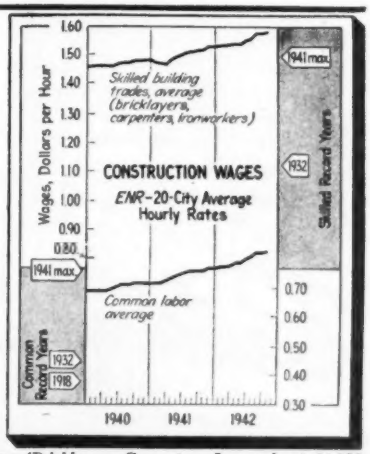
PAINT, ROOFING—F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *b*	Ferric Oxide *d*	ROOFING SUPPLIES Carload lots f.o.b. factory Rolls, slate surfaced, 85–90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal	Tar pitch 350 lb. bbl. per ton
Atlanta	$10.25	$14.125	$1.30	$2.25	$1.20	$1.90	$1.61	$1.61	$0.27	$29.00
Baltimore	10.00	13.75	2.00	3.00	2.50	2.30	2.70	2.70	.40	29.00
Birmingham	10.25	14.125	2.35	3.50*r*	1.98*r*	2.04	1.97	1.97	.32	28.35
Boston	10.00	13.75	1.55	....	2.25	2.12‡	1.72*h*‡	1.72*h*‡	.50‡	20.00‡
Chicago	10.00	13.75	2.11	2.63	1.72	1.75*hf*	1.66*hf*	1.82*hf*	.33*f*	23.00*f*
Cincinnati	10.00	13.75	1.70	2.90	1.60	2.40	2.39*h*	2.39*h*	.36	21.00
Cleveland	10.00	13.75	2.10	4.80	1.95	1.93	1.83*h*	1.83*h*	.35	29.00
Dallas	10.00	14.50	1.88	2.11*n*	.05*l*	1.75*h*	1.66*h*	1.66*h*	.35	39.00
Denver	10.50	14.25	1.65	....	.27*l*	2.45	3.15	3.15	.35	28.00
Detroit	10.00	13.75	1.75	3.00	1.60	2.40	2.50	2.50	.35	22.00
Kansas City	10.00	13.875	2.39*g*	2.55*gr*	2.16*gn*	2.10	2.30	2.30	.28	27.50
Los Angeles	10.25	14.25	1.60	2.25	2.30	2.10	1.50	....	.45	.....
Minneapolis	10.00	13.875	....	....	....	1.75*i*	1.66*hi*	1.66*hi*	.32	23.00
Montreal	9.25	6.25	2.85*p*	4.70*p*	2.70*p*	2.85	2.58	2.07	.63	1.85*k*
New York	10.00	13.75	2.05	2.55	1.64	1.66	1.58*h*	1.58*h*	.26	25.00
Philadelphia	10.00	13.75	....	....	....	1.75	1.66	1.66	.32	23.00
Pittsburgh	10.00	13.75	1.05	1.95	.80	1.95	1.94*h*	1.94*h*	.34	26.00
St. Louis	10.00	13.75	2.28	2.89	1.96	1.65	1.66	1.66	.28	23.00
San Francisco	10.25	14.00	1.80	2.75*n*	1.35/2.35	1.71	2.40	2.40	.33	19.50
Seattle	10.25	14.25	1.90	3.00	....	2.15	2.16*h*	....	.35	26.50*j*

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3-49A. *c* ASTM Spec. D266–31. *d* 80% minimum ferric oxide. *e* Subject to 25% discount. *f* Distributors' price to contractors. *g* 5 gal. can *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per 100 lb. *l* Per lb. *m* Per bbl. *n* May, 1941 price, no later quotation available. *p* Plus 8% sales tax. *r* Not available, except on priority rating; then quoted specially.

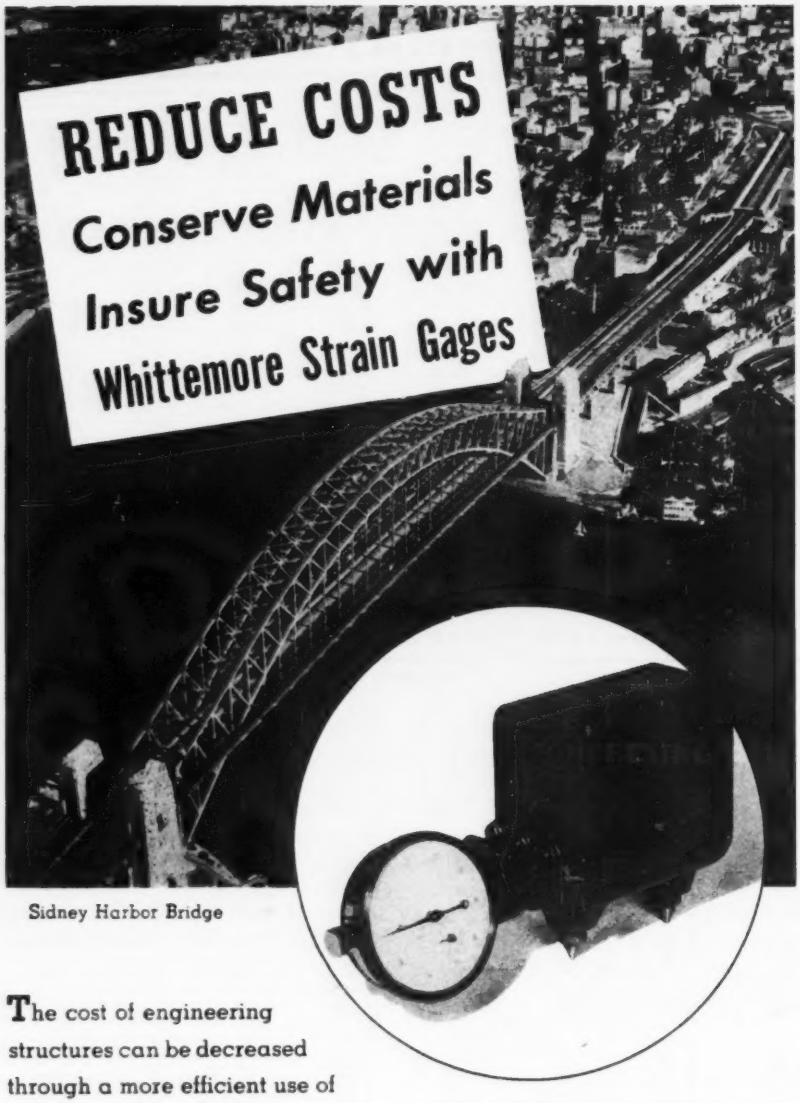
SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$1.375	$1.00	$1.375	$1.00/1.25	$1.25	$0.40	$0.50
Baltimore	1.625	1.375	1.80	1.625/1.80	1.50	.70	.70
Birmingham	1.75	1.125/1.25	1.50	1.25/1.50	1.50	.65	.65
Boston	1.625	1.50	1.65	1.875	1.667	.80/1.00	.80/1.00
Chicago	1.75	1.70	1.76	1.75	1.825	1.10	1.10
Cincinnati	1.75	1.50	1.625	1.40/1.55	1.625	.80	.80
Cleveland	1.75	1.50	1.75	1.75	1.75	1.00	1.00
Dallas	1.625	1.25	1.50	1.75	1.625	.60	.75/1.25
Denver	1.65*b*	1.43*b*	1.43*b*	1.43*b*	1.51*b*	.718*b*	.718*b*
Detroit	1.675	1.50	1.75	1.675/1.75	1.675	.90	.90
Kansas City	1.65	1.50	1.625	1.625	1.65	.90	.55
Los Angeles	1.50	1.50	1.50	1.50	1.667	.75	.75
Minneapolis	1.50	1.375	1.50	1.40	1.50*e*	.925	.925
New Orleans	1.50	1.25	1.50	1.375	1.375	.65	.65
New York	2.00*b*	1.85*b**	2.00	2.00*b*	2.00*c*	1.031	.95
Philadelphia	1.90	1.50	1.90	2.00	2.00	.825	.825
Pittsburgh	1.90	1.50	1.75	1.5625/1.625	1.75	.80	.70
St. Louis	1.75	1.50	1.75	2.00	1.75	.95	.95
San Francisco	1.75*c*	1.375	1.60	1.50	1.667*c*	.875	.875
Seattle	1.715	1.415	1.615	1.565	1.715	1.015	1.10
Montreal	.965	.855	.90	.80	.945	.505	.505



b 7 hr. day. *c* 6 hr. day. *d* 35 hr. wk. *e* 30 hr. wk. *Negotiating now for increased rate.

ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.589
ENR Common Average: $0.826



Sidney Harbor Bridge

The cost of engineering structures can be decreased through a more efficient use of material and the elimination of members which do not carry their share of the load. Safety can be insured by determining whether or not computed stresses are in close agreement with actual stresses.

Whittemore hand strain gages are inexpensive—can be used by observers having little training. With these, stresses in each member of a complex structure can be determined at a reasonable cost. Whittemore strain gages—rugged, simple, and accurate—are available in 2-in. and 10-in. gage lengths. Write for Bulletin N-153 describing these and other Southwark strain gages.

Baldwin Southwark

DIVISION OF THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

BLW THE BALDWIN GROUP

Miscellaneous Notes on Booklets and Reprints

(*Continued from p. 96*)

Accompanying the manual is an appendix containing questions to be answered by the individual students. The manual with appendix sells for 10c. per copy; a considerably lower price is charged for quantities both of the manual and the appendix.

WAR-TIME PROTECTION OF INDUSTRIAL PLANTS is the title of a supplement that is included in the revised 1942 edition of "Handbook of Industrial Safety Standards," published by the National Conservation Bureau, 60 John St., New York. (Price, 55c., paper cover; 75c. in leatherette cover.) The supplement relates to organization of police and warden service for plant protection, fire protection and protection against incendiary bombs and sabotage.

New Engineering Books

MODERN CAMOUFLAGE—By Major Robert P. Breckenridge. 280 pp. Farrar & Rinehart, Inc., New York and Toronto. $3.50.

NEW COMMERCIAL AND TECHNICAL DICTIONARY — Spanish-English: English-Spanish. The Chemical Publishing Co., Inc., 234 King St., Brooklyn, N. Y. $10.

NATURAL TRIGONOMETRIC FUNCTIONS TO SEVEN DECIMAL PLACES FOR EVERY TEN SECONDS OF ARC — Second edition. By Howard Chapin Ives. 351 pp. John Wiley & Sons, Inc., New York and London. $9. *The new edition gives tangents and cotangents of small angles (0 to 2 deg.) to single seconds.*

CITY WIDE STUDIES OF BASIC FACTORS IN THE PLANNING OF THE CITY OF NEW YORK: 1934–1938—Part I, II, and III. Work Projects Administration for the City of New York. 331 pp. with 128 maps and 141 illustrations. $1.50 from the Regional Plan Association, 400 Madison Ave., New York.

Reports and Pamphlets

CEMENT DURABILITY PROGRAM: First Interim Report—Central Concrete Laboratory, North Atlantic Division, Corps of Engineers, U. S. Army, 320 Washington St., Mt. Vernon, N. Y. $4.25 (Make checks payable to the Treasurer of the United States).

Reports and Pamphlets

FIRE PROTECTION—Air Raid Precautions Handbook No. 13. 1st Edition. Obtainable through British Information Services, 30 Rockefeller Plaza, New York. 30c.

NATIONAL EMERGENCY SPECIFICATIONS FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS—War Production Board. Distributed by the American Institute of Steel Construction, Inc., 101 Park Ave., New York. 25c.

THE PROBLEM OF THE CITIES AND TOWNS—Report of the Conference on Urbanism, 231 Littauer Center, Harvard University.

SPECIFICATIONS FOR SAND-ASPHALT BASE AND SURFACE COURSES (HOT-MIX TYPE)—Construction Specifications A-5. The Asphalt Institute, New York.

TRANSPORTATION IN THE PUBLIC INTEREST—By Grover C. Dillman, Harry E. Stocker and John S. Worley. National Highway Users Conference, Washington, D. C.

LOCKWOOD GREENE ACCOMPLISHMENTS—Industrial, commercial and institutional projects. Lockwood Greene Engineers, Inc., 10 Rockefeller Plaza, New York.

NEW JERSEY MOSQUITO EXTERMINATION ASSOCIATION—Proceedings of the twenty-ninth annual meeting. New Brunswick, N. J.

THE WOOD PRESERVING INDUSTRY AND THE CONSERVATION OF FORESTS—By Grant B. Shipley, 3010 Koppers Bldg., Pittsburgh, Pa.

NUMERICAL PROCEDURE FOR COMPUTING DEFLECTIONS, MOMENTS AND BUCKLING LOADS—By Nathan M. Newmark. Engineering Experiment Station Reprint Series No. 23. University of Illinois, Urbana. 15c.

PROCEEDINGS OF THE TWENTY-EIGHTH ANNUAL ROAD SCHOOL, Purdue University, Engineering Extension Department. Extension Series No. 53. Purdue University, Lafayette, Ind.

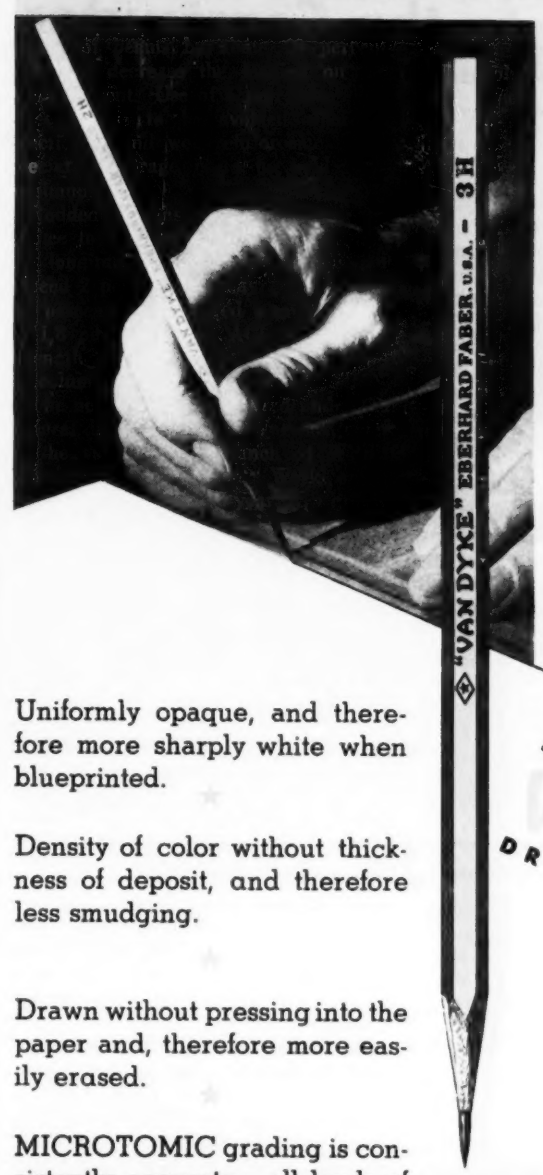
THE ROLE OF THE HOUSEBUILDING INDUSTRY—By Miles L. Colean. National Resources Planning Board, Washington, D. C.

POST WAR PLANNING—National Resources Planning Board, Washington, D. C.

PRIORITIES AND INDUSTRY—Division of Information, War Production Board, Washington, D. C. *The most up-to-date information on priorities and how they are granted.*

HEAT REQUIREMENTS OF INTERMITTENTLY HEATED BUILDINGS—By Elmer G. Smith. School of Engineering, Texas Engineering Experiment Station, College Station, Texas.

HI-DENSITY LINE



The Draftsman's ready answer to war-emphasized insistance on

MORE BLUEPRINTABLE TRACINGS

Drawn with the **HI-DENSITY LEAD** of the modern **MICROTOMIC DRAWING PENCILS**

Uniformly opaque, and therefore more sharply white when blueprinted.

Density of color without thickness of deposit, and therefore less smudging.

Drawn without pressing into the paper and, therefore more easily erased.

MICROTOMIC grading is consistently accurate—all leads of the same degree are always identical.

Hi-density of lead structure:—therefore stronger points and notably longer wear.

TRY THIS UP-TO-THE-MINUTE MEANS OF LIGHTENING THE LOAD FOR THE MAN AT THE BOARD **Free**

EBERHARD FABER PENCIL CO.
37 Greenpoint Ave., Brooklyn, N.Y.

I'd like to test your MICROTOMIC VAN DYKE with the Hi-Density lead. Please send one as indicated below:

.....degree, round lead (choice of 18 degrees)

or.....degree, chisel shaped lead (6H, 4H, 2H, HB, 2B, or 4B)

NAME

NAME OF COMPANY TITLE

STREET AND NUMBER

CITY AND STATE

THE EBERHARD FABER DRAWING PENCIL WITH THE MICROTOMIC LEAD 18 DEGREES ... AND 6 DEGREES WITH CHISEL POINT LEADS

New Aids to the Constructor

Equipment and material announcements and manufacturers' news

Etcher

To meet the present day demand for standardization of equipment, the Ideal Commutator Dresser Co. has designed a new model etcher to cover an extremely wide range of etching heats. This unit, called the No. 18 "Machine Shop" metal etcher, has 14 heats from 115 to 1300 watts. With it, the manufacturer says one can etch anything from thin, delicate metal parts to large, smooth castings. The machine provides permanent identification to minimize loss and theft of costly tools and instruments. Permanent markings additionally avoid confusion and mistakes, and etching trade names and defense plant order numbers on products eliminate cost and delay in obtaining metal nameplates and tags.—*Ideal Commutator Dresser Co., Sycamore, Ill.*

Pipe Repairs

Gustin-Bacon Mfg. Co., mindful of the experience of cities that have undergone air attack in England and other war areas, has developed a new "Rolagrip" coupling to aid in quick pipe repair. To repair a bombed water or gas line, all that is necessary, according to the manufacturer, is to cut out the shattered pipe, (with hacksaw, torch or pipe cutter), fit in a section of pipe of proper length, apply a "Rolagrip" coupling to each end and turn on the service. Emergency surface lines can be laid with unskilled labor as rapidly as pipe can be placed.—*Gustin-Bacon Mfg. Co., Kansas City, Mo.*

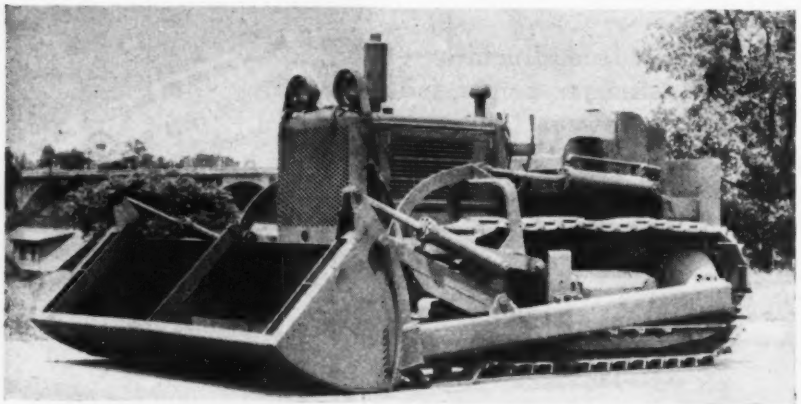
Synthetic Conveyor Belt

The Hewitt Rubber Corporation has completed manufacture of an all-synthetic rubber conveyor belt, which is believed to be the first of its kind made from "Buna S" synthetic rubber, without the addition of natural rubber or reclaimed rubber. "Buna S" is made by chemical combination of butadiene and styrene, and is the general purpose rubber for which the Federal Government is building plants. The "Buna S" is expected to generally replace natural rubber as soon as available in quantities in the company's conveyor and elevator belting, transmission belting, pneumatic tool and welding hose, fire hose,

Bullclam shovel does multiple construction jobs

Something "new under the sun" for construction men is the drop bullclam shovel shown below. According to the manufacturer, the shovel can perform many operations. It is said to do everything a scraper will do, most of the things a shovel can do, everything a bulldozer will do, and other things which none of these units will do. The front clam, with its cutting edge, can be used as a depth gage by merely regulating the depth of the cut by the opening of the clam. By moving forward, the dirt "boils" into the shovel leaving a level footing for the tractor at all times. Without any mechanical adjustments, the operator can tilt either end of the shovel by lever control from the driver's seat. The shovel is built close to the tractor and is perfectly balanced, running free of the tractor.

The manufacturer adds that the shovel might be used for removing trees, boulders, filling in resultant holes, breaking open drains, splitting stone, laying pipe or tile or cable lines, carrying timbers or other equipment and doing many other construction jobs.—*Hi-Way Service Corporation, Drott Equipment, 3841 W. Wisconsin Ave., Milwaukee, Wis.*



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see full page ad page 109

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Buy Blue Brutes

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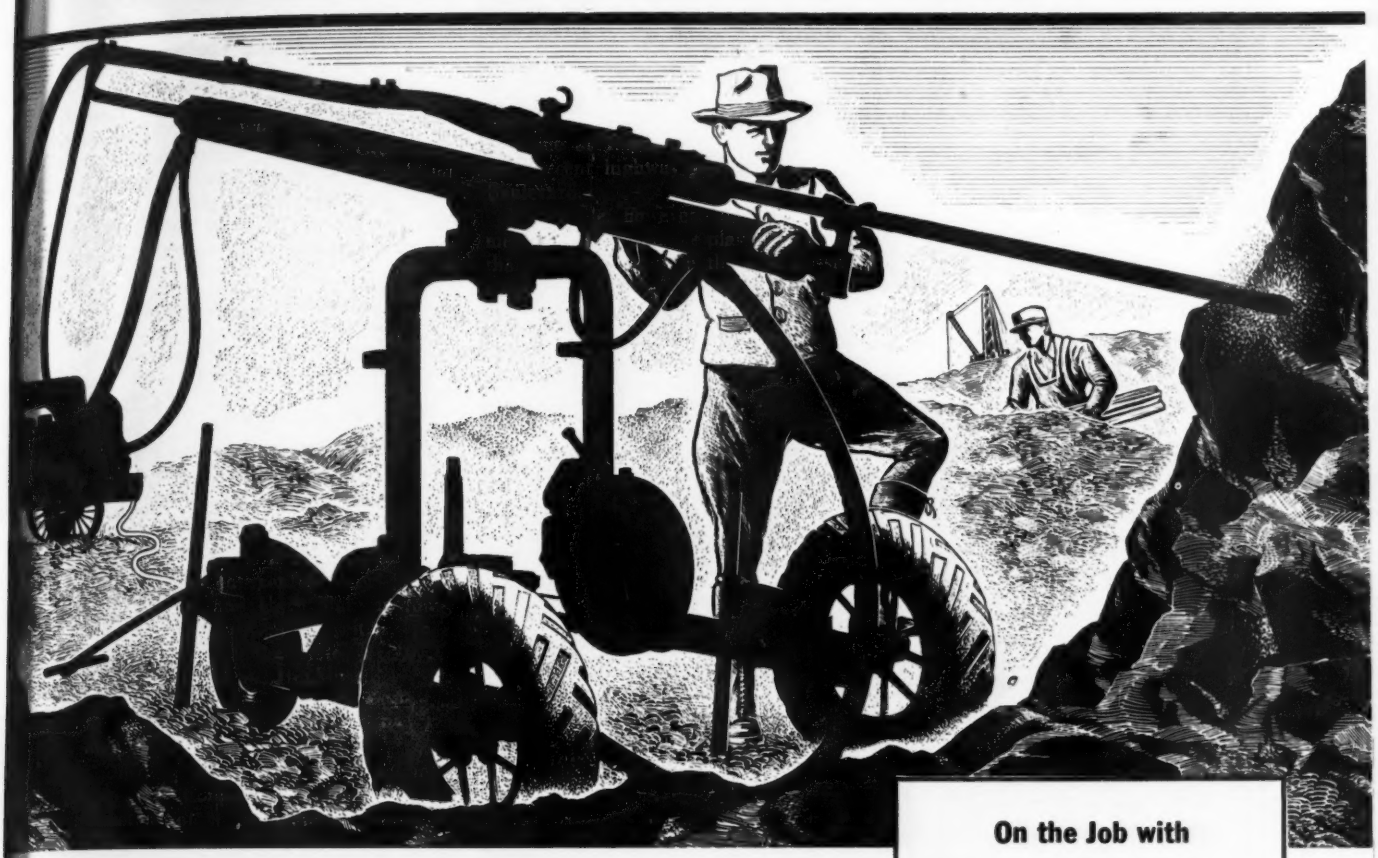

You'll get more punch per pound of air, more staying-power per pound of equipment, with Worthington Blue Brutes in '42!

The rugged "Rockmaster" Wagon Drill (type UPW-35 shown here) is typical of Worthington's complete range of hand-held rock drills, tampers and paving breakers. They're built to *use less air*, and stay on the job longer, at costs surprisingly low!

Smooth, easy-handling strength is characteristic of Worthington's Blue Brute compressors, too. All equipped with Worthington's famous cost-saver — the Feather* Valve... they *deliver more air*, at less cost, under the widest range of operating conditions.

Put your men on the job with Blue Brutes, *now!* A trial will prove to them and to you that you get more WORTH from air with Worthington.

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* Reg. U. S. Pat. Off.

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BLUE BRUTES

"5% more holes per day," says this Super. "The Worthington UPW-35 Wagon Drill is easy to set up. Our operators like its 360° U-arm movement in any direction and the new freedom from stuck steels. They like the fact it can drill a toe hole 2 feet below grade. Yesterday, we began drilling shattered rock, but *still* put down more holes per day than with our previous equipment."

On hundreds of Army, Navy, Air Force and Ordnance projects all over the country, Blue Brutes are at work.

Get more WORTH from air with WORTHINGTON

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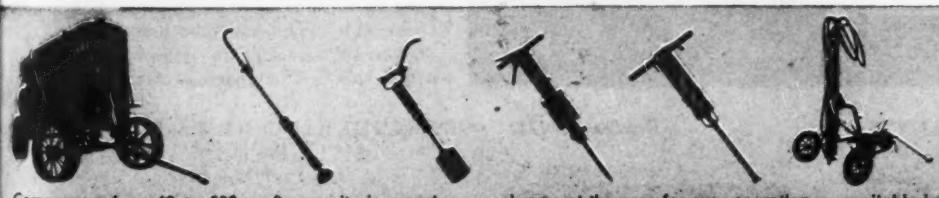

Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs. Rock Drills and Air Tools that have always set the pace for easy operation — available in a wide range of weights and sizes.

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Roaring planes returning to outlying and secret air bases far from electric power lines — inky blackness below. Then compact, portable units, powered with flash-starting Briggs & Stratton gasoline motors, swing into action and floodlights gleam. Ample light for a safe landing and for speedy service. This is but one of scores of jobs that more than a million and a half Briggs & Stratton motors are doing daily — with our armed forces everywhere, as well as on farms, in homes and for industry.

For the duration, in ever increasing quantities, Briggs & Stratton 4-cycle, air-cooled motors are being produced only for war and approved civilian uses.

To assist in the conservation of critical materials, owners and operators of Briggs & Stratton motors are urged to give them more frequent inspection and care than normal, to avoid unnecessary need for repair parts. If additional service or parts are needed, go to your nearest dealer or an Authorized Service Station.

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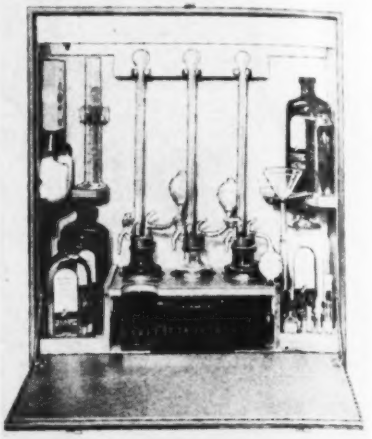
Milwaukee Wis., U.S.A.

4 CYCLE BRIGGS & STRATTON GASOLINE MOTORS

railroad hose and other products.—*Hewitt Rubber Corporation, Buffalo, N. Y.*

Water Testing Equipment

A new series of water test sets is announced by W. H. & L. D. Betz. These "A" series test sets include the necessary chemicals and apparatus for determining hardness, alkalinities, chlorides, phosphates and sulphites in water, when any two, three or four of these tests are required. A special cabinet



designed for use on table or wall is provided. All chemicals and apparatus are contained in a cabinet, held in a secure position and ready for instant use. A portion of the open cabinet door forms a convenient acid-resistant laboratory work-table, and a fluorescent light provide correct illumination for the tests. The protection afforded by the cabinet minimizes breakage and eliminates errors caused by dust or dirt.—*W. H. & L. D. Betz, Gillingham and Worth Streets, Philadelphia, Pa.*

Blueprint Lettering Method

More than 300 man-hours a week in drafting room time has been saved in war plants where engineering lettering machines are employed for the placing of bills of materials, notes and specifications on drawings, according to the Ralph C. Coxhead Corporation. The company's product, the Vari-Typer, is basically a standard office composing machine, equipped with instantly changeable types and faces, operating like a typewriter, but able to take a sheet 20 ft. long. The carriage is movable so that operators can work on any section of the sheet. An ingeniously divided feed roll lever permits the extension of the tracing roll beyond the ends of the normal carriage in the machine. Interchangeable cylindrical type fonts permit the use of a variety of styles and sizes of alphabet. The spacing arrangement

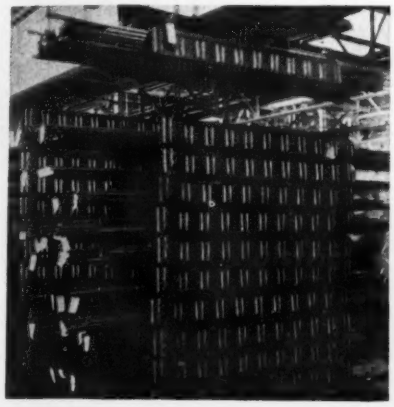
is variable to permit the use of alphabets with different width letters.—*Ralph C. Coxhead Corporation, 333 6th Ave., New York, N. Y.*

Skin Protection

A water-soluble skin cream that is applied to the hands or other exposed parts before starting work has been developed by the Mitts Manufacturing Co. The cream is said to leave an invisible glove that protects the hands from grease, paint, dust, ink, furniture and metal polish, etc. The mixture is not sticky, not staining and is invisible, but washes off in soap and water.—*Mitts Manufacturing Co., 367 E. 45th St., Brooklyn, N. Y.*

Bar Racks

A new type of materials handling unit, an open-end inverted skid, has been developed by the Union Metal Manufacturing Co. This unit is said to be ideal for the movement and storage of long bars or odd-shaped parts. The solution to handling of such parts is a standard union metal all-steel skid plat-



form turned upside down and equipped with eyed brackets for the insertion of crane hooks. Designed for speedy handling of all kinds of materials within a plant or between plants, these skids, boxes and pallets are available in sizes and types to meet every ordinary requirement. According to the manufacturer, their corrugated design provides added strength and durability and they can be handled equally well with crane, hand pallet or power fork trucks.—*The Union Metal Manufacturing Co., Canton, Ohio.*

New Electrode

A new arc welding electrode, designed to add still more speed to arc welding in war production, is announced by the Lincoln Electric Co. A new electrode, designed as "Fleetweld 11", is created expressly for use with the "Fleet-Fillet" technique of arc welding, recently an-

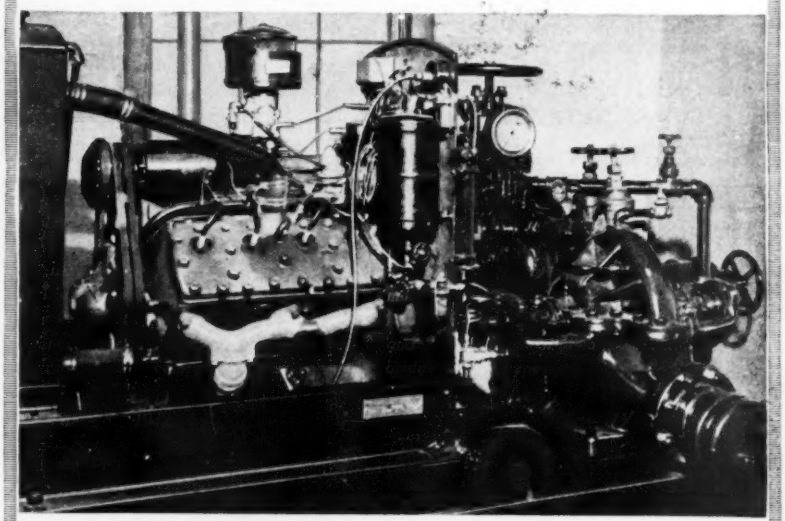
New, Simple

FIRE PUMPS

at Low Cost

● Adequate fire fighting equipment *now* is a vital necessity! Yet the smaller municipalities and factories often find conventional equipment too costly, too complicated.

New, simple, low-priced, Underwriters-approved Fairbanks-Morse fire pumping units have solved this problem for many . . . may do the same for you. F-M engineers are ready to aid in studying your needs. Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago.



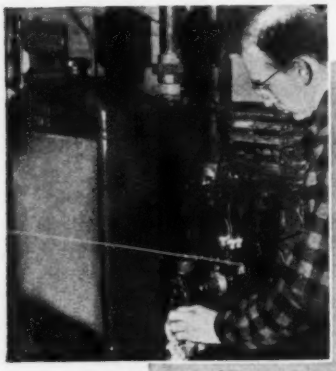
Ready for emergencies in Delavan, Wisconsin, stands this new Fairbanks-Morse fire pumping unit consisting of a 4" F-M Fire Pump driven by a direct-connected Ford-Mercury Engine—for which replacement parts and service are available in nearly every village.

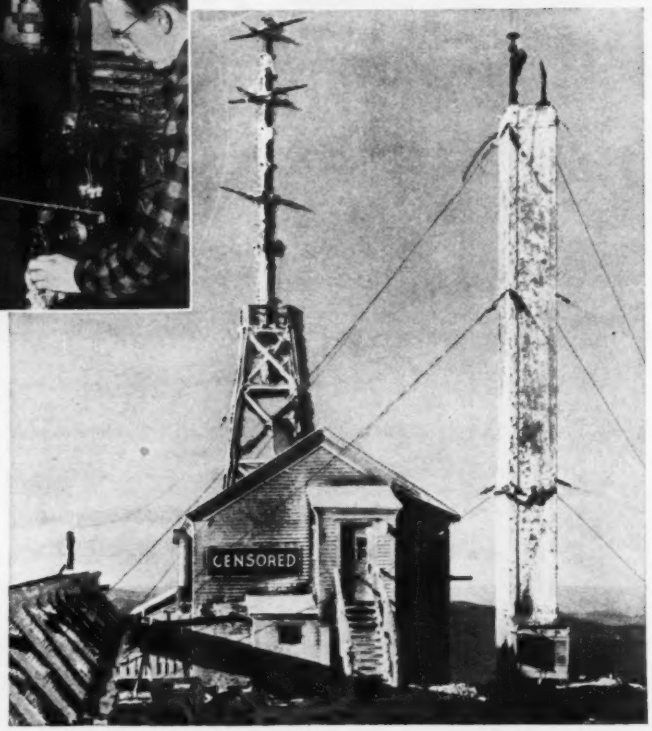
FAIRBANKS-MORSE PUMPS DIESELS MOTORS SCALES

Where the weather is the world's worst...

WAUKESHAS

help to make important wartime observations





★ In wartime nobody "talks" about the weather, but somebody *does* something about it. At the top of one of northern America's tallest mountain peaks blanketed by dreary icy fog 53 per cent of the year . . . where the mercury drops as low as 56° below zero . . . Waukesha Engines are helping the "hermits" whose regular scientific weather observations are now more valuable than ever before.

Storm fronts converge on this peak. There aren't 25 clear days in 365. Average yearly snowfall is 238 in.; rainfall is 80 in. The wind blows a hurricane (75 mi. per hr. or more) two days out of three. In 1934 an anemometer, heated by the Waukesha-powered Kohler electric plant, registered a gust of wind with a velocity of 231 miles an hour—the highest ever officially recorded anywhere!

At this most forsaken post one of the pioneer observers froze to death. Today the hermits sleep under warm electric blankets. Since 1928 their electric and power requirements have been supplied by a Kohler engine-generator unit with a 4-cyl., 133 cu. in. disp., Model FC Waukesha Engine.

The unit also lights the living quarters, provides current for radio transmission of reports, and for radio reception; electrically heats outdoor instruments to keep them functioning; supplies current for the heater grids installed below the surface of the outdoor fresh-water well to prevent formation of ice. Power for the frequency modulation radio transmitter is supplied by a second Kohler plant—Model 10 KVA also Waukesha Engine powered, shown in inset.

Waukesha Gasoline and Oil Engines for Industrial, Stationary and Automotive Power range in size from 5 hp. to over 300 hp. *Get Bulletin 1079.*

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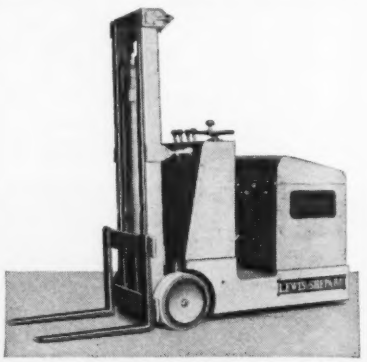
MORE POWER FOR VICTORY

WAUKESHA ENGINES

nounced by the company. The electrode is designed to obtain maximum benefit in speed of welding from the new technique. It is claimed that "Fleetweld 11" is not only a fast-flowing electrode, but that it gives deeper penetration of metal into the root of the joint. It is of a shielded arc type and heavily coated to exclude oxides and nitrides from the weld thus assuring the high quality of weld metal characteristics of the shielded arc process.—*The Lincoln Electric Co., Cleveland, Ohio.*

Lift Truck

The Lewis-Shepard Co. has announced that it has placed in production, after a long period of experiment, design and research, a line of medium capacity (3000 lb.) industrial lift trucks. These trucks are of the tilting fork type, telescopic and non-telescopic, and are offered in both gas and electric powered models. They are said to be rugged, compact and low slung—with a one-piece, ribbed and reinforced, single casting main frame, which keeps the center of gravity low and thus contributes to maneuverability and stability.—*The Lewis-Shepard Sales Corp.,* 504 *Walnut St., Watertown, Mass.*



Paper

An interesting development in the line of papers to take the place of priority materials is that of "Aqualized" paper, a product of the Brown Co., hailed as a substitute for cloth and burlap. With high strength when wet, the paper has already been used for tenting, sand bags and camouflage.—*The Brown Co.,* 500 *Fifth Ave., New York, N. Y.*

AMCREO *Creosoted* PRODUCTS

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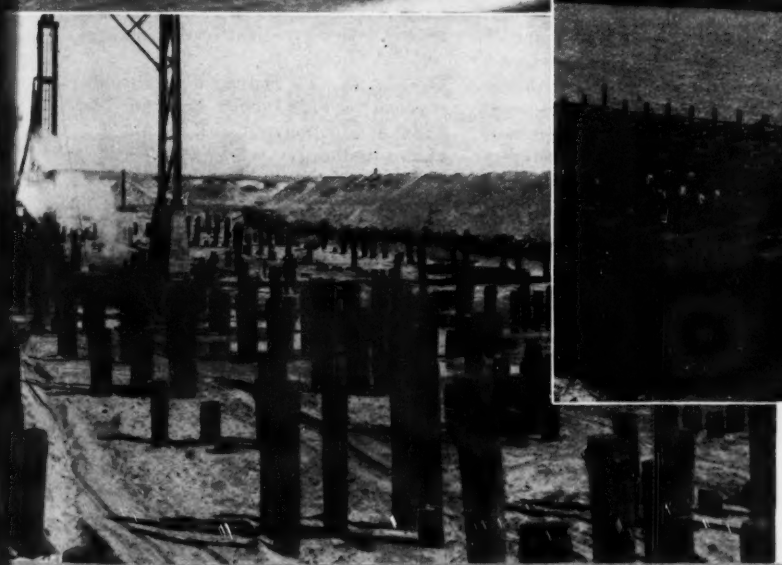

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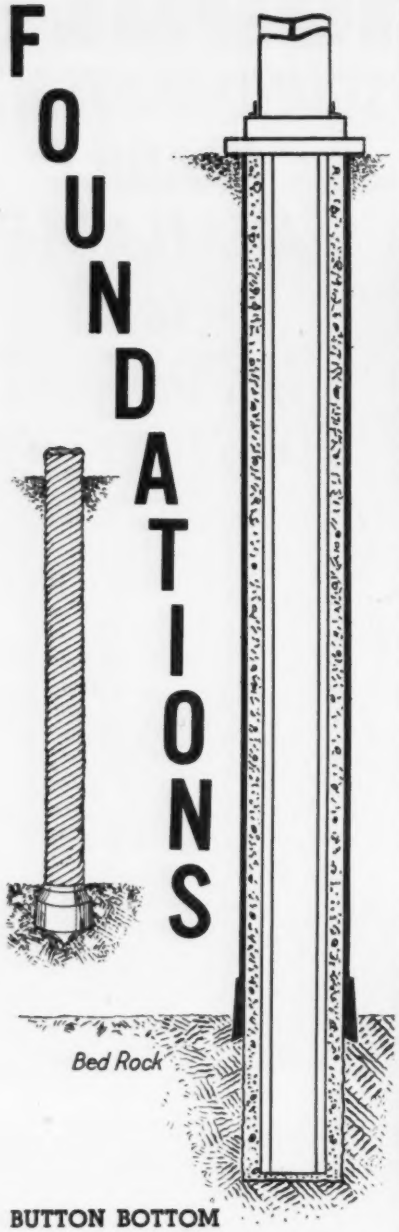

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Manufacturer's Activities

Personnel changes and new plans

HENRY J. CHANON, widely known lighting engineer with the GENERAL ELECTRIC lamp department at Nela Park, Cleveland, Ohio, has been transferred to the company's South Pacific Division, at Los Angeles, Calif. In his new work, Mr. Chanon will specialize in the design of lighting systems for maximum production and efficiency in West Coast aircraft industries, shipbuilding, and war time motion picture production work. Mr. Chanon will also serve as a consultant for blackout of the coastal areas in the Southern California region.

FRANK J. KEVLIN has been appointed traffic manager of THE FALK CORPORATION. He has been handling traffic work for the corporation for a number of years, and will continue in his jurisdiction over the traffic division, additionally acting as manager of the shipping department.

ERNEST F. PIERSON has been appointed manager of the electrical and wire rope department of the AMERICAN STEEL & WIRE CO. at Boston, Mass., succeeding the late Hugo D. Sharp. Mr. Pierson entered the company's mills at Worcester, Mass., about 30 years ago and served successfully in the manufacturing department, and the cable engineering department. In 1934, he became general sales representative, taking a leave of absence in 1941 to serve as advisor to the purchasing division and copper branch of the War Production Board.

BENJAMIN FOSTER, founder and president of the BENJAMIN FOSTER CO. of Philadelphia, Pa., died Sept. 12.

A. R. OLPIN, director of the Ohio State University Research Foundation, has been appointed chairman of the Research Advisory Committee of the NATIONAL ASSOCIATION OF MANUFACTURERS. Dr. Olpin succeeds DR. KARL T. COMPTON, president of the Massachusetts Institute of Technology, who has resigned because of the pressure of war work.

The MISSISSIPPI TRACTOR & EQUIPMENT CO. at Jackson, Miss., has completed details for a new brick headquarters building, to be located on a 6-acre tract of land two miles west of the Jackson City limits. Main part of the building will cover 22,400 sq.ft. of floor space, remainder of tract is to be landscaped.

ROBERT B. LESLIE, former general manager of the VISCHER PRODUCTS CO. of Chicago, has joined the executive staff of COOK ELECTRIC CO.

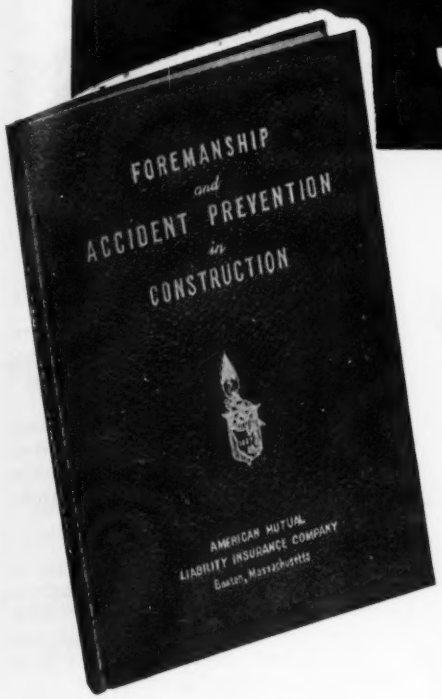
ADMIRAL ERNEST J. KING (shown here), commander in chief of the U. S. Fleet, was principal speaker at a dinner held recently at Cleveland, Ohio, during which Cleveland industries pledged 100 percent cooperation in the nation's war effort. JAMES F. LINCOLN, head of the Cleveland Chamber of Commerce, pledged cooperation in behalf of the city's industries.

BRADFORD C. COLCORD, formerly general superintendent of the NATIONAL TUBE CO.'s works at McKeesport, Pa., has been made assistant vice president in charge of operations of that company. RALPH M. OVERTON, assistant general superintendent, becomes general superintendent replacing Mr. Colcord.

THOMAS D. JOLLY, chief engineer of the ALUMINUM CO. OF AMERICA at its Pittsburgh, Pa., headquarters, has been elected a vice president of the company.

EDWARD W. P. SMITH, 56, consulting engineer for the LINCOLN ELECTRIC COMPANY and nationally known authority on arc welding, died September 19th as he returned to Cleveland after addressing a meeting of the American Welding Society at Indianapolis, Ind. A veteran of more than 20 years service with the company, Mr. Smith had traveled extensively in the last year, in the interest of the War Production Program. Visiting many more industry centers, he had been conducting welding courses, and giving lectures on latest techniques in welding.

Hundreds of Firms Like Yours Have Found New Leaders, With "FOREMANSHIP"



1942's Most Important Construction Handbook Helps Solve Your Industry's Most Vital Problem

Chapter I

Foremanship — the foreman's responsibility to his job, to the superintendent, to his men, to his fellow foremen, to subcontractors and the general public; qualities which make for successful foremen 7

Chapter II

The Foreman's Place in Accident Prevention — planning for accident prevention; accident investigation; developing the accident prevention program . . . 15

Chapter III

The Foreman and His Men — selection and hiring, placing and training, supervisory methods 23

Chapter IV

Job Planning — in relation to long range planning, layout of the job, receipt of materials, day-to-day plan 33

Chapter V

Physical Protection — excavation, staging and scaffolding, runways and platforms, barricades, overhead protection, clothing 41

Chapter VI

Care, Use and Storage of Equipment — principles of selection, testing and inspection; rigging, hand tools, supports, derricks, scaffolds, safe practice rules, machine operators, trucks, cranes, moving equipment, moving material, air equipment, machine guards, yard storage, tool storage 51

IF you are selecting foremen:

Here, in one concise volume, is a thoroughly practical manual that outlines, clearly, completely, all the responsibilities of a foreman, plus the qualities of mind and character that make for successful foremanship, at a time when good foremen are hard to find.

IF you are training foremen:

You also will find in "Foremanship" a simple, orderly guide to classroom lectures or group discussion. It contains the *essential* data for training, brought to you by men with long experience in construction superintendence and reviewed by superintendents now operating large construction contracts. Even your most experienced men will profit from it!

IF you are a foreman:

Here are the fundamentals of foremanship, ideas for improvement, time-saving hints to simplify and speed your work. The men who wrote "Foremanship" — now American Mutual engineers — are not theorists, but men like yourself, with *first hand* knowledge of the problems of foremanship in construction.

Only 62 Pages! But Each One Can Save You Time and Money

Green men — more and faster construction — changing personnel — create problems for many contractors today, problems which this little book is helping to solve. Prepared by American Mutual engineers as a free service to policyholders, in the proven belief that *safety and good foremanship go hand in hand*, it will help you avoid the costly accidents that sudden expansion so often brings. But write for it today — merely attaching the coupon to your letterhead. Get your free copy now, while the supply is still available!

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Modern, comprehensive coverage fitting your special needs for workmen's compensation, contractors' public liability, fire, automobile, fidelity bonds and other forms of casualty insurance written by American Mutual and affiliates.

Admitted Assets	$47,908,092.19
Liabilities	40,659,020.90
Surplus to Policyholders	7,249,071.29

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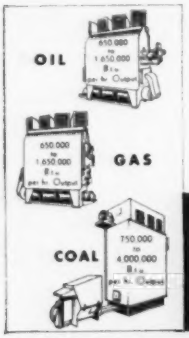
A few years ago a steam plant and distributing system for heat were practically foregone conclusions when plans for industrial buildings were formulated.

Today heat produced direct by Dravo Heaters has been proved to be more, economical of materials—manhours—money—and time! It's easier to get materials when you can prove this!

Acceptance and increased use of the Dravo Direct Fired method of heating industrial buildings over the last 10 years merit the thoughtful consideration of anyone—architect—consultant—heating engineer—plant owner—purchasing agent—anyone who has anything to say about specifying or purchasing heating equipment for needed war production plants.



Complete description of construction and function of Dravo Direct Fired Heaters as well as comparison table showing savings they offer in weight, floor space and fuel consumption, will be found in Dravo Bulletin No. 506, available upon request.

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TIME-TESTED JOINTING COMPOUND
for Bell and Spigot Water Mains

10 REASONS FOR USING

1. One lb. HYDRO-TITE equals 4 lbs. lead.
2. Stands any pressure the pipe can.
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5. Anyone can make tight joints.
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9. Shipped promptly.
10. Demonstration without charge.

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HYDRAULIC DEVELOPMENT CORP.
50 CHURCH STREET — NEW YORK, N. Y.

A diesel engine manufacturing plant near Garland, Tex., formerly operated by the GUIBERSON DIESEL ENGINE Co., has been taken over by CONTINENTAL MOTORS Co. and will be enlarged and rearranged.

R. N. TRANE, president of the TRANE Co., La Crosse, Wis., manufacturers of heating, cooling and air conditioning equipment, recently was awarded the Treasury's Minute Man Flag, signifying that Trane employees are regularly investing 10 percent or more of their pay in the purchase of war bonds, through the payroll allotment plan. R. J. TRANE shown here, assistant treasurer, also attended the ceremonies.

REAR ADMIRAL EMORY S. LAND, chairman of the U. S. Maritime Commission, recently awarded the Maritime Commission "M" burgee to the Barberton Works of the BABCOCK & WILCOX Co.

CHARLES BYRON JOLLIFFE, assistant to the president of the RADIO CORP. OF AMERICA, and chief engineer of RCA laboratories, has been appointed vice president and chief engineer of RCA MFG. Co., of Camden, N. J.

The CARVER PUMP Co., manufacturers of standard and self-priming centrifugal pumps, has changed its factory and main office headquarters from Rock Island, Ill., to Muscatine, Iowa.

JOHN F. NEYLAN has been elected vice president in charge of sales for the LONE STAR CEMENT CORP. Mr. Neylan succeeds H. C. KOCH, who retired recently, and is himself succeeded by J. BYRAN OLDHAM as general sales manager for this corporation.

JOHN H. BAKER, installation superintendent of the WESTERN ELECTRIC Co. at St. Louis, Mo., until 1938, died Sept. 8 at San Antonio, Tex.

In recognition of its outstanding war production record, the storage battery division of PHILCO CORP. has been awarded the new joint Army-Navy "E", according to M. W. HEINRITZ, general manager of the company's Trenton plant.

The BUILDERS IRON FOUNDRY of Providence, R. I., recently was awarded the joint Army-Navy "E" pennant for outstanding production.

WALTER L. MAXON has been appointed manager of ALLIS-CHALMERS MFG. Co's

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But it takes water to build tanks—water for the men who work in the plants—for those who produce the steel for those who operate and service them—and for millions of other people in the Service of Supply. Before plants could be built, armies trained and munitions made, there had to be an abundance of water. Upon the old, reliable and capable shoulders of the Layne Organization fell much of the task of producing that water. Layne swung into action and in record time, built deep well water systems by the hundreds, thus making possible unprecedented war and production programs.

Layne's reputation like that of the "General Grant" tanks, has been won on the field of action. Layne wells and pumps are doing an outstanding job—operating day and night, producing millions and millions of gallons of water for almost every phase of America's war effort. For late bulletins, wire or write LAYNE & BOWLER, INC., Memphis, Tenn.

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WORLD'S LARGEST WATER DEVELOPERS

crushing cement and mining machinery department succeeding HERMAN SCHIFFLIN who will retire. Mr. Maxon, formerly a professor of metallurgy at the Colorado School of Mines, joined Allis-Chalmers in 1927.

J. STUART SHEDDON, formerly vice president of the munitions division of the American Type Founders, Inc., has been named vice president in charge of construction for the H. K. FERGUSON CO.

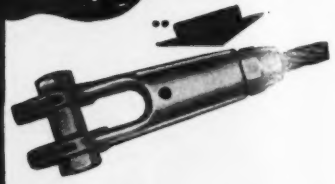
JOHN SLEZAK, president of the TURNER BRASS WORKS, who is now serving as head of the tank branch of the Army's Chicago's Ordnance District, has been promoted from Major to the rank of Lieutenant - Colonel, according to a recent announcement. Commissioned a Second Lieutenant in the Ordnance Reserve in 1924, Colonel Slezak was called to active service in January of this year. He is an engineering graduate of the University of Wisconsin, and prior to associating with the Turner company, he was employed by the WESTERN ELECTRIC CO.

WILLIAM T. HEDLUND of Summit, N. J., has been named president of the ELASTIC STOP NUT CORP., it was announced recently by the Board of Directors. Mr. Hedlund has been a director of the corporation, and was formerly vice-president of the Electrolux Corporation in charge of engineering, and is widely known both in legal and industrial circles as a patent authority.

H. H. BARBER, president of BARBER-GREENE CO., was one of those in attendance recently, when his company was awarded the joint Army-Navy "E" burgee for excellence in war production. More than 700 employees witnessed the ceremonies which were staged in front of a train load of ditching, airport paving, and other construction equipment enroute to United Nations' bases throughout the world. Each of the shop and office employees received a silver "E" pin for his work.

The INDEPENDENT PNEUMATIC TOOL CO., manufacturers of THOR pneumatic and electric tools, has announced new locations of its branch offices at Boston, Mass., and Birmingham, Ala. The Boston Office, now managed by VANCE G.

A POSITIVE GRIP
Why?



THE gripping unit in an Electroline-Fiege Wire Rope Connector holds like a Bulldog because it has a "Positive Grip". The holding compression is graduated from front to rear so that danger of crystallization, due to vibrations, is eliminated. Frayed strands and early failures are avoided.

Many other advantages, such as greatly increased wire rope life, elimination of hazards to workmen, etc., have made these connectors first choice for dependable results. Let us send you an interesting booklet, "Positive Grip". It will give you complete performance data on this easily installed, better and more economical streamlined connector. Write today.

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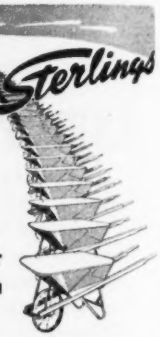


Simple, Dependable Method of Material Transport for War or Peace-Time Production

It is an impressive fact that literally millions of wheelbarrows have been manufactured by the Sterling Wheelbarrow Company since its inception almost 40 years ago. Regiments of sturdy Sterlings are now helping Uncle Sam win the War . . . and more will be available in the reconstruction period ahead.

STERLING WHEELBARROW CO., MILWAUKEE, WIS.

Sterling
WHEELBARROWS

TURNER, has moved to 78 Brookline Ave. and the Birmingham office has moved into its own new home at 1411 North Third Avenue.

The SALEM ENGINEERING Co. of Salem, Ohio, has purchased the TOLERTON ENGINEERING Co. of Youngstown, manufacturers of locker storage systems and air conditioning and refrigeration units.

The MARION STEAM SHOVEL Co. of Marion, Ohio, has been awarded both the Victory Fleet Flag and the "M" burgee for outstanding achievement in the nation's war production effort. The "M" pennant and the Victory Fleet flag were presented to the company by an officer of the Maritime Commission in a ceremony October 5.

LESTER O. HILLS, 47, a GOODYEAR TIRE AND RUBBER Co. engineer for 26 years, died recently at his home in Akron.

IRWIN A. MARSHALL, Cleveland, Ohio, sales engineer and specialist on speed reducers, couplings and gears, has been added to the contact engineering staff of FOOTE BROS. GEAR AND MACHINE CORP., to represent the company in the Cleveland and Northern Ohio territory.

Construction will begin immediately on works to convert the CARNEGIE-ILLINOIS STEEL CORPORATION'S tinplate mill at Canonsburg, Pa., into an aluminum drop forging unit for ALUMINUM COMPANY OF AMERICA. One of the plant buildings will be expanded, and a new structure will be erected in place of several smaller buildings now existing.

WALTER J. KELLY has been appointed manager of the industrial relations department of the TENNESSEE COAL, IRON AND RAILROAD Co.

HAROLD E. CODY of Ashtabula, Ohio, has been appointed assistant superintendent of the eastern district of the CLEVELAND ELECTRIC ILLUMINATING Co.

A. J. GRASSIC, general manager of INGALLS SHIPBUILDING CORP., Pascagoula, Miss., has resigned.

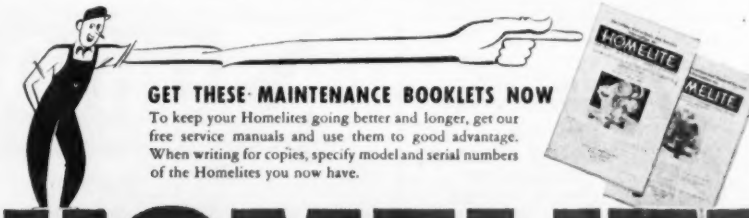
JAMES TURNER GIBSON, SR., 75, a pioneer in furnace operations in the Birmingham, Ala., District, and at one time general superintendent of blast furnaces, for the TENNESSEE COAL, IRON AND RAILROAD Co., died at Birmingham recently.

EUGENE L. SPENCER, 83, formerly a member of the CALDWELL FOUNDRY & MACHINE Co., died at Atlanta, Ga., recently.

The POWER of SMALL TOOLS

Rushes Work through the Day Small, electric hand tools — such as saws, drills, sanders, vibrators, etc. — save time on important jobs. But these electric tools need operating power. Hundreds of contractors get this power from Homelite Portable Generators — handy, self-operating, gasoline-engine-driven units that are easily and quickly put into operation anywhere.

Rushes Work through the Night For those that work the night shift, Homelite Portable Generators furnish electric power for operating brilliant floodlighting — so necessary for fast and safe work. With capacities up to 3,000 watts, Homelite Portable Generators can be used to operate floodlights and several electric hand tools, all at the same time.



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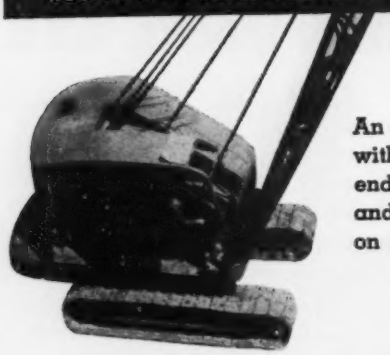
FOR GREATER STRENGTH AND SPEED



An operator really makes time with a Williams Bucket on the end of his boom. A few grabs and another full loaded truck is on its way.

Williams Buckets have tremendous closing power—they dig deep—bite clean and come up with heaping loads. Williams Buckets are "built to last and move dirt fast". And that's exactly what a contractor wants—long service at little maintenance cost, and fast, dependable action when moving yardage spells profits.

If you want the full engineering story on each type and capacity of Williams Buckets, send for individual descriptive folder. You'll find ample reasons why your next bucket should be a Williams.

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15 to 50 TONS CAPACITY
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NEW PUBLICATIONS

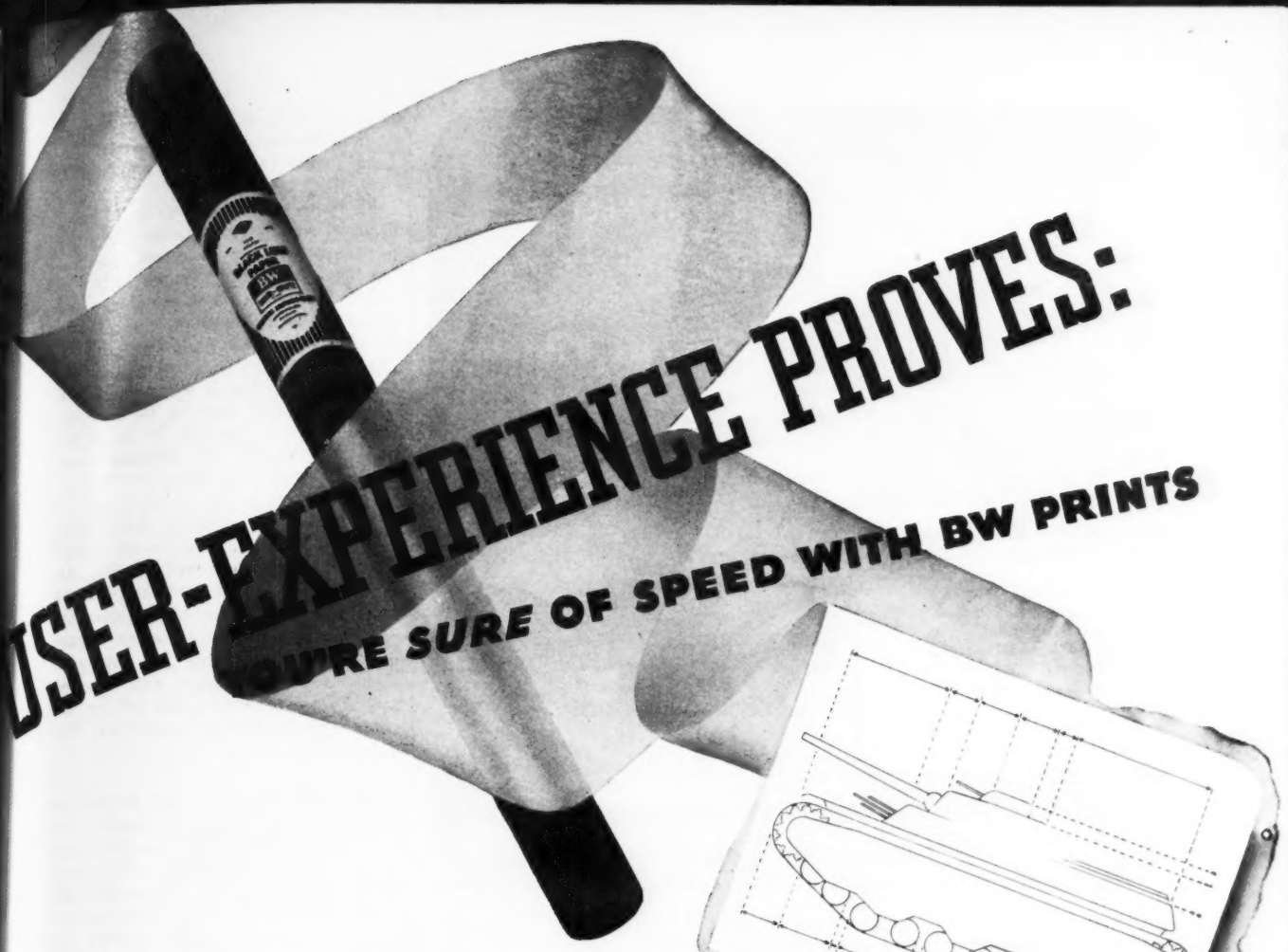
War Heroes—Among the unsung heroes of America are the earth movers, machines able to move mountains, or prepare small sites for construction of vitally needed war plants. Celebrating the real war contribution of these machines and the men who operate them, the Baker Mfg. Co. has issued a booklet handsomely illustrated to show what its tractors have and are accomplishing on the road to victory.—*The Baker Mfg. Co., Springfield, Ill.*

Review—The quarterly issue of "Electrical Review," publication of the Allis-Chalmers Co., is just off the presses, containing numerous interesting articles dealing with the company's products and their best and most efficient use.—*Allis-Chalmers Co., Milwaukee, Wis.*

Masonry—A booklet recently published by the North American Cement Corp. contains complete information and test data on the company's Blue Bond Mortar Cement, and includes valuable reference tables for the determination of mortar quantities and the number of masonry units required for various types of construction.—*North American Cement Corp.*, 285 *Madison Ave., New York, N. Y.*

Redwood—Demand throughout the war effort for practical substitutes to replace critical materials has developed such increased interest in Redwood tanks and vats that the California Redwood Association recently published a reprint of its Technical Bulletin No. 16, "Redwood Tanks and Vats" revised both as to text and illustrations. The bulletin presents a revealing, overall picture of the wide usage of Redwood tanks and vats in American industry, and points out that there are in fact few manufacturing enterprises which may not benefit by their use to some extent. It is a brief answer to many wartime questions about Redwood tanks and vats, and a prelude to more detailed data sheets available on types of tanks for specific industries.—*California Redwood Association*, 405 *Montgomery St., San Francisco, Calif.*

Centrifugal Pumps—Two-stage centrifugal pumps of the opposed impeller design are described in a 12-page catalog issued by the DeLaval Steam Turbine Co. In this type of pump, both impellers are of the single-suction type, the suction openings facing outwardly, so that axial thrust is balanced. Only two pairs of wearing rings are required. The casing is so arranged that both the suction and discharge nozzles are in the lower half, and all parts of the



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This Bruning machine is only one of many which Bruning offers for every size of business or industry. It is automatic in action—exposes and develops prints within a few seconds without washing or drying. It provides big volume production with only a SINGLE *operator—compared to the two or three required to operate the blue print machine of similar capacity.*

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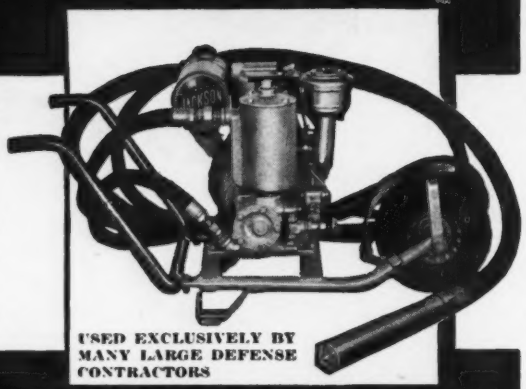
- Adjustable frequency to 6800 R.P.M.—submerged in concrete.
- Powerful gas engine—4.7 H.P.
- Long-lived, ball-bearing, rotary, hydraulic pump.



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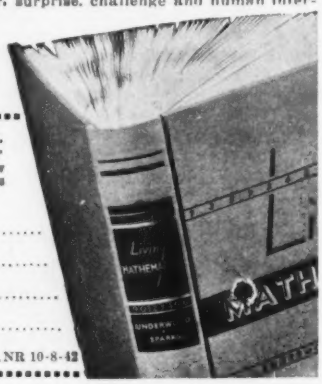
LIVING MATHEMATICS

By R. S. Underwood and Fred. W. Sparks
Texas Technological College

365 pages, 6x9, $3.00

HERE is just the book for - - those who have met with initial failure in trying to master the intricacies of the subject: and now, as adults, can be expected to make real headway when the subject is presented as a fascinating pastime - - those who 'took to it' readily when first presented; and now wish to pick up the threads and go on to higher mathematics, — the calculus and number theory

In this book you will find drama, zest, humor, surprise, challenge and human interest.



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pump are accessible and can be removed upon removing the casing cover.—*De Laval Steam Turbine Co., Trenton, N. J.*

Plywood—Technical data on plywood, urgently sought by engineers and architects, are presented in a new loose-leaf handbook offered by Douglas Fir Plywood Association. It is one of two new pieces of basic literature issued by the fir plywood industry, dealing with applications of the big flat panels. The second publication is a loose-leaf catalog of industrial uses for the material. Supplements to both will be issued frequently.—*Douglas Fir Plywood Association, Tacoma, Wash.*

Southern Pine—"How to Build Southern Pine Barns and Implement Sheds" is the title of a new Southern Pine Association publication for distribution by lumber dealers. The new publication contains 14 designs of modern storage barns and four plans for implement sheds, and much other data showing how the use of lumber will aid the war effort.—*Southern Pine Association, New Orleans, La.*

Repairing Valves—A new bulletin on piping pointers (No. 5 in series), has just been issued by the Crane Co. It explains and illustrates the various steps to be taken in repairing leaky gate and globe valves, as well as giving hints on how to reclaim discarded valves. Although all valves will wear out in service, this bulletin enables the users of such equipment to get better and longer service by keeping them in good operating condition.—*Crane Co., 836 S. Michigan Ave., Chicago, Ill.*

Fuel Conservation—A new consumer booklet entitled "Tips on Fuel Conservation" has been published by the Air Conditioning and Commercial Refrigeration Department of the General Electric Co. Fuel saving facts are presented in three sections—the first concerning heat loss; the second heating equipment and heating systems, and the third, deals with service calls and suggestions on how to avoid unnecessary calls.—*General Electric Company, Air Conditioning and Commercial Refrigeration Department, 5 Lawrence St., Bloomfield, N. J.*

Speed—A method of reproducing drawings, letters, performance sheets, blueprints, and almost any other engineering written work is described in a broadside issued by the Photo Reproducing Equipment Co. Describing the various models of "Trucopyphote" machines available for this work, the broadside also gives maximum capacity of the machine, and prices of operation and purchase.—*Photo Reproducing Equipment Co., Chatham, N. J.*

May the wreath we have won never wither

THE War Department and the Navy Department of the United States have conferred upon the men and women of Chain Belt Company the highest honor that can be paid to civilians engaged in war work . . . the Army-Navy "E" for outstanding achievement in production.

Because of our knowledge of the intense determination for Victory which has inspired Chain Belt workers in their willingness to serve and sacrifice, we were not surprised that the award was made. We knew it had been earned and we are gratified that this just recognition has been given.

The Army-Navy "E" pennant will fly proudly from the Chain Belt flagstaffs; and from the lapel of every worker will gleam the shining badge of honor which the Government has cast to signify individual and collective effort beyond the normal conception of duty.

Chain Belt will endeavor to maintain the pace which it has established—to produce more and more for the triumph of our arms.

May the wreath we have won never wither!

THE LAUREL *of this wreath is a symbol of the Victory which Chain Belt workers are determined to win.*

THE OAK *of the wreath symbolizes the strength of the nation—on the battle lines and on the production front.*

CHAIN BELT CO.
OF MILWAUKEE

Perhaps the curtailment of rubber has put your plant on the "spot." You've got to do something about the problem of material handling. It is possible that track haulage is the answer. If so, investigate Plymouth Locomotives for their versatility, dependability and low initial cost. Plymouths have a record behind them . . . a record for low cost operation, minimum upkeep and dependable performance. Plymouths are built to stand up in all kinds of service and under all conditions.

While our plant is "geared up" on work for Uncle Sam, we can possibly co-operate with you in the installation of track haulage. Write and tell us your requirements . . . no obligations, of course.

PLYMOUTH GASOLINE and DIESEL LOCOMOTIVES
PLYMOUTH LOCOMOTIVE WORKS
Division of The Fate-Root-Heath Co. PLYMOUTH, OHIO, U. S. A.

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MITCO
OPEN STEEL FLOORING
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90% Open Area
Easy to Install
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ABOUT MEN

William M. Cobleigh, dean of the Montana State College engineering school at Bozeman, has been named acting president of the institution.

Charles Atkinson Jackson, Jr., of Seattle, has been commissioned a captain in the Corps of Engineers and assigned to the Seattle engineer district as Upper Columbia Area engineer at Wenatchee, Wash.

Col. Richardson Selee, formerly chief of the Fort Peck, Montana, district for the Corps of Engineers, has become head of the Kansas City, Mo., district. He is succeeded at Fort Peck by **Maj. Howard H. Roberts,** previously division engineer at Kansas City.

Capt. Samuel E. Holt, of High Point, N. C., has been made base engineer officer for the Jamaica, B.W.I., base command.

Howard W. Eves, of the mathematics staff of the Tennessee Valley Authority at Chattanooga, Tenn., has been appointed assistant professor of applied mathematics in the College of Applied Science at Syracuse University, Syracuse, N. Y.

William W. Demerritt, of Key West, Fla., has been appointed a member of the Overseas Road and Toll Bridge District Commission.

Ing. Pedro Martinez Tornel, Mexican civil engineer, has been elected a director of the National School of Engineering of the National University of Mexico, at Mexico City.

Henry E. Kendall, for the past six years engineer in charge of operations and plants for the State School Commission at Raleigh, N. C., has joined the Corps of Engineers as a first lieutenant assigned to the chemical warfare unit.

Willard Farrington Babcock has been appointed assistant professor of civil engineering in the North Carolina State College School of Engineering at Raleigh.

Gordon D. Russell, a graduate in civil engineering of McGill University, Canada, has received a commission as a flying officer in the Royal Canadian Air Force.

John J. Hughes, formerly associated with the construction bureau of the War Production Board, is now superintendent for the George A. Fuller Co. in construction of a factory at Chicago, Ill.

E. B. Gibbs, resident engineer for the

AND JOBS

North Carolina State Highway & Public Works Commission at Durham, N. C., has resigned to enter Army service. **W. D. White**, senior resident engineer at Lexington has taken Mr. Gibbs' place.

J. P. Estabrook, formerly an engineer with Price Bros. & Co., Ltd., at River Bend, Que., has joined the engineering staff of the Aluminum Co. of Canada at Shawinigan Falls, Que.

Lieut.-Col. A. G. Viney, in charge of U. S. District Engineer's Office at Jacksonville, Fla., has been promoted to the rank of Colonel.

J. D. Belle-Isle, formerly an engineer for the Bell Telephone Co. of Canada in Montreal has been commissioned a flying officer in the RCAF.

Wilbur Wright Mattox, construction equipment engineer of Charlotte, N. C., has been commissioned a lieutenant (jg) in the Navy and has reported to Dartmouth College, N. H., to enter a naval engineering School.

Capt. Henry G. Taylor, now public officer at the Norfolk, Va., Navy Yard, has been nominated for promotion to Rear Admiral. Captain Taylor, a civil engineer, was plant superintendent at the Philadelphia Navy Yard from 1925 to 1928, and has supervised engineering work at Cavite, P. I., and the 12th Naval District on the Pacific Coast.

Lester C. Hammond, chief borough engineer for the Borough of Manhattan, N. Y. C., has resigned his post, and been succeeded by **Dean G. Edwards,** a consulting engineer in the Borough President's office.

S. W. Gray, assistant hydraulic engineer of the Nova Scotia Power Commission, has been appointed maritime regional representative of the Canadian Wartime Bureau of Technical Personnel, with offices at Halifax.

S. O. Southall, Jr., formerly resident engineer at Wilson, N. C., for the North Carolina Highway & Public Works Commission, has been commissioned a lieutenant in the Corps of Engineers.

C. Neufeld, recently an engineer for the Dominion Bridge Co. at Calgary, Canada, has become assistant engineer in the bridge department of the Canadian Pacific Railway at Montreal.

Capt. Edwin Johnson, area engineer for the Peublo, Colorado, ordnance plant, has been promoted to the rank of major.

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Maj. Robert F. Herdman, area engineer at the Denver ordnance plant, promoted to lieutenant-colonel.

T. C. Thompson, formerly an engineer for the Bell Telephone Co. at Montreal, Canada, has returned to Canada after service overseas.

Alexander Brest, secretary and treasurer of the Duval Engineering and Contracting Co. of Jacksonville, Fla., has been commissioned a major in the Corps of Engineers.

H. O. Wagner has been promoted to acting chief draftsman at the Colorado State Highway Department in Denver, during the absence of **Capt. John S. Marshall.**

Oscar Schilling, of Sidney, Ohio, formerly Shelby County engineer, has been promoted city engineer at Kent, Ohio.

L. B. Barker, formerly engineer with the Sanitary District of Chicago, has accepted a commission as a major in the Corps of Engineers, Great Lakes Division.

John D. Watson, assistant professor of civil engineering at Duke University School of Engineering, Durham, N. C., has been granted a leave of absence to serve as engineer in construction of a large airport project in Mississippi.

C. W. Haupt, vice-president of the Strobel Construction Co. of Chicago, has recently been commissioned a major in the Corps of Engineers.

W. U. Norwood, Jr., engineer officer stationed at Marietta, Ga., has been advanced to the rank of captain in the Corps of Engineers.

A. M. Nash, who has been serving in various engineering capacities in the California State Division of Highways for the past 22 years, has been appointed district engineer at Eureka, succeeding the late E. R. Green.

J. E. McDaniel, director of cooperative engineering courses at the Georgia School of Technology, has been appointed regional director of training for hte War Manpower Commission in Southeastern states.

Charles D. King, of Raleigh, N. C., formerly engineer with the North Carolina State Board of Health, has been called to active service as a first lieutenant in the U. S. Army.

M. M. Maxwell, who was an engineer for the National Youth Administration in Louisiana, has been appointed to the engineering staff of the Southern Pine Association.

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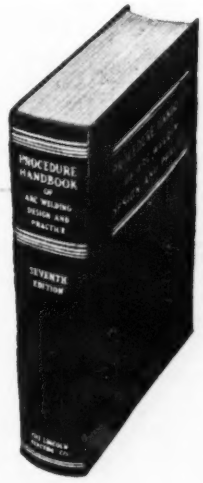
HERE IS STRUCTURAL WELDING INFORMATION

to guide you in complying with WPB national emergency specifications for design, fabrication and erection of structural steel for buildings.



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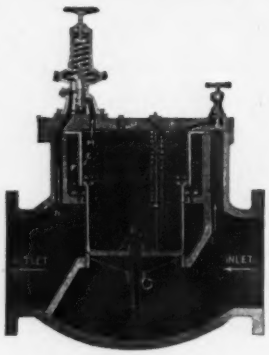

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MEETINGS

AMERICAN WELDING SOCIETY, 23rd annual meeting, Hotel Cleveland, Cleveland, Ohio, Oct. 12–15.

AMERICAN SOCIETY OF CIVIL ENGINEERS, Fall meeting, jointly with the Engineering Institute of Canada, Hotel General Brock, Niagara Falls, Ontario, Oct. 14–15.

NATIONAL RECLAMATION ASSOCIATION, Denver, Colo., Oct. 14–16.

AMERICAN PUBLIC WORKS ASSOCIATION, Cleveland, Ohio, Oct. 18–21.

ASSOCIATED GENERAL CONTRACTORS, fall board meeting, Drake Hotel, Chicago, Ill., Oct. 19–20.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION, Hotel Sherman, Chicago, Ill., Oct. 20–22.

NATIONAL SAFETY COUNCIL, 31st National Safety Congress and Exposition. Chicago. Hotel Sherman, La Salle and the Morrison. Convention headquarters in the Sherman, Oct. 27–29.

AMERICAN PUBLIC HEALTH ASSOCIATION, St. Louis, Mo., Oct. 27–30.

FEDERATION OF SEWAGE WORKS ASSOCIATIONS, 3rd annual convention, Hotel Statler, Cleveland, Ohio, Oct. 22–24.

INSTITUTE OF TRAFFIC ENGINEERING, Sherman Hotel, Chicago, Ill., Oct. 25–26.

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS, 8th annual meeting, Claypool Hotel, Indianapolis, Oct. 31.

INDUSTRIAL HYGIENE FOUNDATION, 7th annual meeting, Mellon Institute, Pittsburgh, Pa., Nov. 10–11.

HIGHWAY RESEARCH BOARD, 22nd annual meeting, Hotel Statler, St. Louis, Mo., Dec. 2–4.

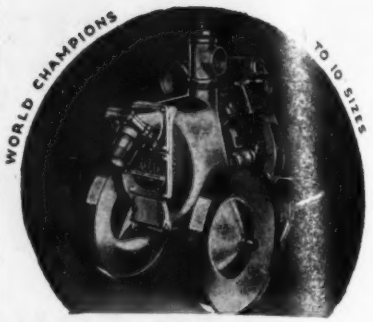
AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, annual meeting, Hotel Statler, St. Louis, Mo., Dec. 7–9.

REGIONAL AND LOCAL MEETINGS

SOUTH DAKOTA RECLAMATION ASSOCIATION, annual convention, Pierre, Oct. 8–9.

SOUTHWEST SECTION, AMERICAN WATER WORKS ASSOCIATION, War-Time Conference, Little Rock, Ark., Oct. 12–14.

NEW YORK SECTION, AMERICAN WATER



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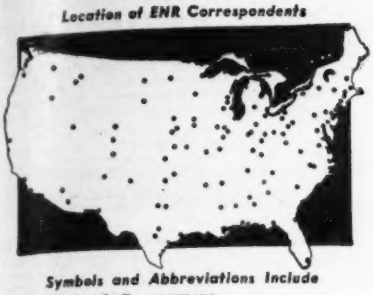
Location of ENR Correspondents



Symbols and Abbreviations Include

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily
A-E-M Architect — Engineer-Management type of contract.

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger; water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply	Unclassified
Sewers, Waste Disposal	Latin America
Bridges, Grade Cross'gs	Public Buildings
Streets & Roads	Commercial Buildings
Earthwork, Waterways	Industrial Buildings

Stages Reported

†PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR);

LOW BIDDERS: On jobs below $500,000 value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

Note: To comply with censorship requirements, addresses on some reports are being generalized. Data which would reveal the purpose of the improvements and the size are withheld. The name of contractor and general area are reported.

WATER SUPPLY

PROPOSED WORK

Ia., Knoxville—F. Crawford, city clk., imprv. water plant. $28,500.

Ia., Ottumwa—F. Gibbons, city clk., 3 mi. 12 and 16 in. watermains. $130,000. Application filed for FWA funds.

†Me., Portland—Federal Works Agency, 2 Lafayette St., New York, N. Y., retained Thompson & Lichtner Co., Inc., engrs., 620 Newberry St., Boston, Mass., for services in connection expanding Portland Harbor water line.

Minn., Minneapolis—500,000 gal. reservoir, 18,800 ft. 12 and 6 in. water pipe. Applied federal funds.

Pa., Bradford—20 in. c.i. watermain into industrial dist. $65,000. J. H. Quirk, City Hall, engr.

†R. I., Newport—Federal Works Agency, 2 Lafayette St., New York, N. Y., retained Charles & A. Maguire & Associates, engrs., Turk's Head Bldg., Providence, in connection with water supply project. **FWA.** CD 7/15—ENR 7/23.

Wash., Renton—Earlington Water Dist., c/o Gardner, Gardner & Hitchings, engrs., Architect Bldg., Seattle, rejected bids July 10, water sys., Earlington Dist., near here. $30,000. CD 7/15—ENR 7/23, under Lb.

B. C., Vancouver—City Secretary bids soon chlorinating water supply. $75,000.

Que., Sawyerville—G. W. Loveland, city clk., imprv. WW. $15,000.

BIDS ASKED

Bids Asked October 10 or 15

†South Carolina—U. S. Eng., Post Office Bldg., Savannah, Ga., WW, sanitary sewerage and electrical distr. sys., Aiken Co.

Bids Asked

†Texas—U. S. Eng., 231 W. Main St., Denison, deep wells water supply, facilities, appurtenances, Collin Co. $60,000. Thomas-Sharp-Welsh & Goodwin, 407 Construction Bldg., Dallas, engrs. and archts.

†Texas—U. S. Eng., 25 St. and Avenue F, Galveston, drilling, casing, developing several complete water supply wells with electric motors and gasoline engine standby units, Limestone Co., over $15,000. Plans deposit $50. Niven, Staub-Rather-Jenkins, Bankers Mortgage Bldg., Houston, engrs. CD 8/28-9/3, under Public Bldgs.

LOW BIDDERS

Michigan—State Hy. Dpt., Lansing, Sept. 23, pump house, surge tank, pumps, etc., Detroit Industrial Expressway, Telegraph Rd., from Fry & Kain, 411 W. Gier St., Lansing, **$33,316.** CD 9/16.

Mich., Battle Creek—City, Sept. 28, underground concrete reservoir, part WW expansion, from Phelps-Wagner Co., Battle Creek, **$156,000.** CD 9/16—ENR 9/24.

★ **†Ohio**—U. S. Eng., U. S. Post Office & Courthouse, Cincinnati, Sept. 18, laying pipe for Mill Creek Valley Water Supply Project, No. Ohio 33-234, Butler and Hamilton Counties, from Murdock Constr. Co., 1654 Sherman St., Norwood, Cincinnati, S. A. Ruebel & Co., 4301 Kirby Rd., Cincinnati, and O'Connell & Sweeney, Inc., Kellogg and Tennyson Sts., Cincinnati, **$500,000-$1,000,000.**

★ **Pa., Phila.**—Dpt. P. Wks., Bureau Water, Sept. 28, Torresdale Pumping Station, Contr. 133-WWI, from Kaufman Constr. Co., 1505 Race St., **$1,088,888.** CD 9/8—ENR 9/10.

†Texas—U. S. Eng., Fort Sam Houston, Sept. 24, WW sys. imprvs., Spec. 42-400, from S. A. Machine & Supply Co., 325 N. Center St., San Antonio, under **$50,000.** CD 9/17.

CONTRACTS AWARDED

★ **†Ala., Mobile**—Federal Works Agency, 18 and F Sts. N.W., Wash., D. C., expanding, imprv. WW sys., 20 m.g.c. filtration plant and new main to supplement water supply, to A. H. Guion & Co., Wilkinson Blvd., Charlotte, N. C., **$1,268,000.** Awarded 9/24.

†California—U. S. Eng., 751 S. Figueroa St., Los Angeles, expanding water supply sys., Orange Co., to R. A. Wattson Co., 1026 N. McCadden Pl., Los Angeles, under **$100,000.** Awarded 9/26.

†Connecticut — U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., water-sewer utilities, No. 699-43-60, New Haven Co., to Pascone Bros., Inc., 73 Steuben St., Bridgeport. Est. over **$25,000.** Bids 9/22. CD 9/18.

Conn., Bristol—Bd. Water Comrs., 119 Riverside Ave., water intake, Cranberry Pond near Reservoir 1, to F. & M. Constr. Co., 6 Beacon St., Boston, Mass. Est. **$15,000.** Bids 9/28. CD 9/17—ENR 9/24.

†Florida—U. S. Eng., Court House, Jacksonville, water supply and distr. sys., Inv. Neg. Jax 43-358, Dixie Co., to L. T. Saine, 4511 French Ave., Jacksonville, under **$50,000.** Awarded 9/25. CD 9/4—ENR 9/10.

†Florida—U. S. Eng., Court House, Jacksonville, water and sewerage sys., Inv. Neg. Jax 43-265, Hillsborough Co., to M. R. Boyce, Clearwater, under **$50,000.** Awarded 9/24.

†Florida—U. S. Eng., Court House, Jacksonville, ww distr. sys., Neg M. B. 43-4, Dade Co., to F. J. Rooney, 600 NE 116 St., Miami, under **$50,000.** Awarded 9/26.

†Georgia—U. S. Eng., Court House, Jacksonville, Fla., water and sewers, Thomas Co., to Scott Constr. Co. and B. L. Brewton & Sons, Thomasville.

★ **†Illinois** — U. S. Eng., 520 Merchandise Mart, Chicago, raw water pipe line and distr. sys., Fulton Co., to T. F. Cloghessy, Hammond, Ind., **$500,000-$1,000,000;** elevated water tanks, to MacDonald Eng. Co., 1 N. LaSalle St., Chicago, **$100,000-$500,000.**

†Me., Portland—Portland Water Dist., 16 Casco St., pipe for watermains, Me. 17-134, to Monroe & Tompkins, 180 Green St., Boston, Mass., **$16,843;** owner also supplying pipe cost, **$17,699. FWA.** CD 9/23—ENR 10/1, under CA.

†Mass., Springfield—Water Dpt., Municipal Bldg., fabricating 2nd pipeline, 40,000 ft. 50-in. diam. steel pipeline, West Parish Filters to Province Mountain Reservoir, Mass., 19-106, to Walsh Holyoke Steam Boiler Works, Inc., 110 Appleton St., Holyoke, **$195,197. FWA.** CD 5/11—ENR 5/14.

★ **†Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, water reservoir, pumphouse, Macomb Co., to Wermuth Inc., 14800 Meyers Rd., Detroit, under **$1,000,000.**

†Mississippi—U. S. Eng., U. S. Postoffice & Courthouse, Vicksburg, water supply wells, Panola Co., to Layne Central Co., Millsaps Bldg., Memphis, Tenn., under **$50,000.**

†Montana — U. S. Eng., Administration Bldg., Fort Peck, erection prefabricated wooden water tank and steel substructure, Glacier Co., to H. Aronson, Santa Rita, under **$50,000.**

†Nebraska—U. S. Eng., 10 E. 17 St., Kansas City, Mo., water wells and equip., to Layne-Western Co., World Herald Bldg., Omaha. Est. under **$50,000.**

†N. Y., Schenectady—C. A. Harrell, city mgr., Unit 1, water expansion project, 9 gravel wells, appurtenances, installing pumps, to Layne-New York Co., Inc., $87,000. Total est. $425,849. **FWA.**

†N. C., Elizabeth City—City, water sys. and imprvs., N. C. 31-208, to N. A. K. Bugbee, Portsmouth, Va. **$88,226. FWA.** CD 9/29—ENR 10/1.

★ **†Ohio**—U. S. Eng., 700 Union Guardian Bldg., Detroit, Mich., underground concrete fire pump houses, water storage tanks, concrete fdns. and masonry walls for primary stepdown substation and underground oil storage tank fdns. and concrete pumphouse, Cuyahoga Co., to Faulkner Constr. Co., 1150 Griswold St., Detroit, Mich., less than **$1,000,000.**

†Texas—U. S. Eng., Fort Sam Houston, deep water test well, Coryell Co., to Wm. Cravens & Son, 501 Hays St., San Antonio.

†Texas—U. S. Eng., 25 St. and Avenue F, Galveston, drilling, reconditioning wells, Hidalgo Co., to Ballantyne Eng. Co., 2100 Commerce Bldg., Houston, under **$50,000.**

†Washington—U. S. Eng., 810 3 Ave., Seattle, drilling test wells for watersupply, Grays Harbor Co., to Patterson Drilling Co., R.F.D. 4, Olympia, under **$50,000.**

Alta., Vulcan—Dpt. Natl. Defense for Air, Ottawa, Ont., water and sewerage sys., Flying Instructors' School 2, to Bennett & White Constr. Co., Ltd., 302 Examiner Bldg., Calgary, **$30,000.**

Man., Rivers—Dpt. Natl. Defense for Air, Ottawa, Ont., watermains, sewers, etc., at No. 1 Air Navigation School, to Dominion Constr. Co., Ltd., 1044 Arlington St., Winnipeg, **$26,000.**

Ont., Petawawa—Dpt. National Defense, Ottawa, pump house reservoir, WW intake pipe exten., Military Camp, to McLaughlin Bros., Ltd., 120 Scott St., Ottawa, about **$35,000.** Bids 9/11.

Ont., Peterboro—Wartime Housing Ltd., 55 York St., Toronto, watermains, sewers, roads at housing development, to Scott-Jackson Constr. Co., Ltd., 57 Bloor St. W., Toronto, about **$30,000.** CD 9/14—ENR 9/17.

Que., Ste. Croix de Lothiniere—J. E. Michaud, city clk., imprv. WW, to A. Laroche, 7 Notre Dame St., St. Antoine les Fonds. Est. **$15,000.** CD 9/1—ENR 9/10.

Que., St. Hyacinthe—M. A. David, city clk., exten. filtration plant, to W. G. Hunt Co., Ltd., 1405 Bishop St., Montreal, **$216,723.** Est. $200,000. CD 8/26—ENR 9/3.

Que., Ville La Salle—Distillers Corp., Ltd., 1430 Peel St., Montreal, water intake pipe, to A. F. Byers Constr. Co., Ltd., 1226 University St., Montreal, **$20,000.**

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Calif., Richmond—Main outfall sewer from 13 and Lucas Sts. down 10 St. to waterfront. $300,000. Earl C. Thomas & Associates, 2273 Waverly St., Palo Alto, engrs.

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Atlantic, Gulf and Pacific Co.

21 Park Row, New York
Houston, Texas, Scanlon Bldg.

SEWERS, Proposed Work (Continued)

†**Connecticut**—Pub. Housing Auth., NHA 24 School St., Boston, Mass., bids October, sewage disposal sys., Knapps Hy. & Melville Ave., for housing. $75,000-$100,000. Whitman & Howard, 89 Broad St., Boston, Mass., engrs.

★†**Conn., Bridgeport**—Dpt. P. Works, plans ready in November, trunk sewer, Jonsons Creek, Water St., Waterview and Seaview Aves., Conn. 6-107. $1,319,732. FWA. H. L. Rowland, City Hall, engr. CD 6/24—ENR 7/2.

†**Kansas**—U. S. Eng., 10 E. 17 St., Kansas City, Mo., sewage treatment plant, Leavenworth Co. Under $100,000.

†**New Jersey**—U. S. Eng., 6 and Walnut Sts., Phila., Pa., sewage disposal plant and sewerage sys., Burlington Co. $40,000. Malcolm Pirnie, 25 W. 43 St., New York, N. Y. engr. and archt.

O., Lancaster—Storm sewerage sys. to drain 163 acres land Reese Addn. $44,930. W. Graf, city engr.

†**Okla., Oklahoma City**—City, M. B. Cunningham water supt., sewer construction, Docket 34-177-F. $80,000. **FWA.**

N. S., Halifax—City Clerk bids soon enlarging incinerator $47,000, or constructing addnl. one $58,000 and $89,000.

†**Miss., Pascagoula**—City, Div. 1, primary sewage treatment plant, 8 sewage lift pump stations. Plans deposit $25; Div. 2, exten., impry. sewage collection sys. Plans deposit $50, both FWA 16-138.

Ont., Hamilton—City Council, 84 in. sewer in Barton St. to Strathearne, also tunnel section 4x4½ ft. to Weir St. $347,000. W. L. McFaul, City Hall, engr.

Que., St. Hyacinthe—R. Richer, city mgr., bids soon, 4 mi. trunk sewer. $445,000.

BIDS ASKED

Bids Asked October 14

†**Md., Hyattsville**—Washington Suburban Sanitary Comn., H. R. Hall, ch. engr., Hamilton St., constructing 4,555 ft. 15 and 24 in. vitr. sewers, Contr. 154-S. Plans deposit $5; adv. ENR 10/8.

Bids Asked October 19

†**N. Y., Cheektowaga**—Town Bd., Town Hall, drainage ditch imprvs., known as U-Crest Ditch, N. Y. 30-136, **FWA.** A. Sturm, town clk. Nussbaumer & Clarke, Inc., 327 Franklin St., Buffalo, consul. engrs.; adv. ENR 10/8. CD 9/30—ENR 4/16.

Miss., Pascagoula—City, c/o Mayor and Councilmen, City Hall, exten., impry. sanitary sewerage sys. $75,000. Plans deposit $50. L. C. Winterton, Pascagoula, engr. CD 6/25—ENR 7/2.

LOW BIDDERS

N. Y., Deer Park—Dpt. Mental Hygiene, State Office Bldg., Albany, Sept. 30, sewers, gas and water lines at Edgewood State Hospital, from Queens Water Pipe Corp., 96-29 Rockaway Blvd., Ozone Park, **$78,000.** CD 9/16—ENR 9/24.

†**Oklahoma**—U. S. Eng., 416 Wright Bldg., Tulsa, addnl. sewage treatment plant, Muskogee Co., from J. Pray, Monett, Mo. **$50,000-$100,000.** CD 9/29—ENR 10/1.

†**Wash., Seattle**—Federal Works Agency, Alaska Bldg., Sept. 30, trunk sewer in White Center Dist., from Valley Constr. Co., 8423 48 Ave. S., **$187,387, FWA.** CD 9/23—ENR 10/1.

CONTRACTS AWARDED

†**Florida**—U. S. Eng., Jacksonville, sewage collection, treatment and disposal sys., Inv. Neg. Jax 43-263, Duval Co., to O. P. Woodcock, Duval Bldg., Jacksonville. Under **$50,000.** Awarded 9/24.

†**Massachusetts**—U. S. Eng., Park Sq. Bldg., Boston, sewerage sys., Middlesex Co., to Coughland Constr. Co., Inc., 80 Federal St., Boston, under **$50,000.**

N. J., Bloomfield—15 to 54-in. rein.-con. sewers, repaving streets, etc., **WPA, $59,490.** CD 9/22—ENR 10/1.

N. J., East Orange—12 to 15-in. concrete storm sewers in Several Terrace, Everett, Sandford, William and Main Sts., **WPA. $55,000.** CD 9/22—ENR 10/1.

N. J., Secaucus—12-in. rein.-con. sewers, **WPA, $52,500.** CD 9/22—ENR 10/1.

†**Tex., Garland**—J. R. Stultz, city secy., Contr. 2, sewerage sys. imprvs., Tex. 41-908, to J. L. Meyers, 206 W. Commerce St., Dallas, **$27,812.** Total est. $50,392. **FWA.**

†**Va., Newport News**—Pub. Bldgs., Admin., North Interior Bldg., Wash., D. C., portion Boat Harbor outlet sewer line, to C. H. Lawson, Williamsburg. **$230,020.**

†**Va., Radford**—City Council, sewerage sys. addn., to M. S. Hudgins, Roanoke, **$187,351. FWA.** Bids 9/22. CD 8/26—ENR 9/3.

SEWERS, etc. (Contracts Awarded, Cont'd.)

†**Texas**—U. S. Eng., 231 W. Main St., Denison, sanitary sewers, water and gas sys., Gray Co., to Parrott-Oldt Co., 403 S. Haskell St., Dallas, $50,000-$100,000.

†**Texas**—U. S. Eng., 231 W. Main St., Denison, sanitary sewers, water and gas sys., No. 257-43-73, to Parrott-Oldt 403 S. Haskell St., Dallas, $100,000-$500,000. Awarded 10/1.

Ont., Sarnia — Dominion Govt., Ottawa, sewer to plant of Polymer Corp., Ltd., to Johnson Bros. Co., Ltd., 43 Market St., Brantford. Est. **$35,000.** H. G. Acres & Co., Ltd., 1879 Ferry St., Niagara Falls, engrs.

Que., Longueuil—Sewage disposal plant, to J. S. Henson, 660 St. Catherine St. W., Montreal, about **$35,000.** CD 9/18.

Que., Ste. Anne de Bellevue — Dominion Govt., Ottawa, Ont., sewer, Military Hospital area, to Chas. Duranceau Ltd., 5847 Hamilton St., Montreal, **$40,000.** E. J. Turcotte, 1010 Ste. Catherine St., Montreal, archt. Dpt. P. Wks., Ottawa, Ont., engrs.

BRIDGES GRADE CROSSINGS

PROPOSED WORK

California—Dpt. Hys., Sacramento, overpass on Waldo approach to Golden Gate Bridge. $100,000. C. H. Purcell, state hy. engr.

Alberta—Provincial Govt., Edmonton, replacing timber bridge with steel bridge, Empress, **$30,000**; bridge over Saskatchewan River, Rocky Mountain House, $200,000; bridge to replace ferry, Smith; bridge over North Saskatchewan River, Elk point, $250,000. N. W. MacPherson, Dpt. Pub. Wks., Edmonton, engr.

★**Alberta**—Provincial Govt., Edmonton, concrete, steel bridge, Okotoks, **$170,000**; bridge over River Athabaska, Hy. 2, Edmonton, $150,000; steel, concrete bridge over Old Man River, Lethbridge, $200,000; bridge, Ponoka, $160,000; bridge, Blackfalds; bridge, Midnapore, $150,000. N. W. Macpherson, Dpt. P. Wks., Edmonton, engr.

Alberta—Provincial Govt., Edmonton, bridge over Big Smoky River, Edmonton; replacing timber bridge at Cluny, $25,000. N. W. Macpherson, Dpt. P. Wks., Edmonton, engr.

Alberta—Provincial Govt., Edmonton, replacing timber bridge, Brockett, $30,000; bridge over McLeod River, Edmonton, $150,000. N. W. Macpherson, Dpt. P. Wks., Edmonton, engr.

Man., Pembina—Municipality, bridge over Pimbina River, $25,000.

Saskatchewan—Provincial Govt., Regina, bridge over South Saskatchewan River, Swift Current, $350,000. Dpt. Hys., Regina, engrs.

BIDS ASKED

Bids Asked October 13

Indiana—State Hy. Comn., S. C. Hadden, chn., Indianapolis, 48 ft. bridge over Dry Run Creek and 76 ft. bridge over Little Eagle Creek, both on W. 10 St., Indianapolis, Marion Co.; 180 ft. bridge over Youngs Creek and 30 ft. bridge over Harriotts Creek, both Johnson Co.; 28 ft. bridge over Von Range Ditch, also paving, grading, small structures Rd. 50, both Jackson Co. $200,000.

Bids Asked October 21

California—State Div. Hys., Sacramento timber bridge across Herndon Canal, grading, plant mix surfacing approaches of Fresno St. and Shield Ave., Fresno Co. C. H. Purcell, state hy. engr.

LOW BIDDERS

Washington—State Hy. Dpt., Olympia, Sept. 29, redecking, painting Cowlitz River Bridge and Northern Pacific Overpass, Cowlitz Co., from S. Bergersen, Wick & Dahlgren, P. O. Box 25, McChord Field, Tacoma, **$87,280.** CD 9/17, under Roads.

CONTRACTS AWARDED

Texas—State Hy. Dpt., Austin, concrete box culverts 7.097 mi. Dallas Co., to Ernest Loyd, 3101 Stadium St., Fort Worth, **$35,451.** Est. $40,000. Bids 10/2. CD 9/22—ENR 9/24.

STREETS AND ROADS

BIDS ASKED

Bids Asked October 12

N. J., Lumberton—Lumberton Twp., Town Hall, gravel surfacing 5,855 sq. yd. Masonville Rd. W. M. Gibbs, 223 High St., Mount Holley, engr.

Bids Asked October 13

Ill., Peoria—Gravel or crushed stone surfacing 1.0293 mi. Sect. 12 A-2-CS. G. H. Baker, Centennial Bldg., Springfield, state engr. co. roads and city streets.

Bids Asked October 13

N. J., Belleville—Grading, F.A.R.C. 2 surface on 6 in. concrete paving 24,200 sq. yd. Main St. H. Welsh, Town Hall, engr.

Ohio—State Hy. Dpt., Columbus, removing defective ties, etc., grading, concrete paving 1.217 mi. Sects. Lima and I of SH 126, U.S. 25, Allen Co., $35,520; asphaltic concrete resurfacing 1.65 mi. Sect. Bedford of SH 12, Cuyahoga Co., $38,800; tar concrete leveling course and rock asphalt surface course resurfacing 3.666 mi. SH 195, 29 and U.S. 68 and 35, Greene Co., $73,900; furnishing, spreading aggregate for traffic bound surface course 12.597 mi. Sects. A and B SH 765, Monroe Co., $11,600; hot mixed, hot laid asphaltic concrete resurfacing 0.451 mi. Sect. Akron of SH 66, Summit Co., $15,130; grading, draining, sidewalks, etc. 3.968 mi. Sects. H and I of SH 3 and 2, Trumbull Co., $8,300; bituminous treating 28.62 mi. Sects. SH 71, 872, 325 and 918, Mahoning, Stark, Summit and Trumbull Counties, $59,479.

O., Cleveland—Comrs. Cuyahoga Co., G. H. Stahler, clk., sheet asphalt paving Madison Ave. $30,000. J. O. McWilliams, Standard Bldg., engr.

Bids Asked October 14

D. C., Wash.—District Comrs., District Bldg., concrete curbing, guttering, asphaltic concrete on concrete paving, storm water sewer, drainage structure, Independence Ave. S.W., from 14 to 17 Sts. $280,000.

North Carolina—State Hy. & P. Wks. Comn., Raleigh, grading, soil base, sand asphalt surfacing 3.42 mi. County Project 225, New Hanover Co., $100,000-$125,000; concrete paving 4.12 mi. Project 4155, U.S. 15, Durham and Granville Counties, $50,000-$75,000. W. V. Baise, Raleigh, engr.

Bids Asked October 16

Tennessee—State Hy. Dpt., Nashville, reconstructing base, bituminous surfacing 2.3 mi. State Hy. 33, Cusick Rd., Sect. 1, beginning 1 mi. east of State Hy. 73 to Rockland; 3.85 mi. Wilkerson Rd., Sect. 2, from south limits of Maryville exten. southeasterly; 6.9 mi. Friendship Rd., Sect. 3, from approx. 4 mi. west Maryville to Friendship; 8 mi. Wildwood Rd., Sect. 4, from Alcoa to State Route 35; 2.8 mi. Montvale Rd. from Maryville exten. southwardly; 3.15 mi. Louisville, Sect. 6, from Maryville northwardly; 1.45 mi. Proffett Rd., Sect. 7, from Louisville Rd. to State Hy. 73.

Bids Asked October 20

Pa., Pittsburgh — Comrs. Allegheny Co., widening, reconstructing Bower Hill Rd., Scott Twp.; Hawkins Ave. from Overland to Middle Sts., North Braddock. L. B. Duff, County Office Bldg., engr.

Bids Asked October 21

California—State Div. Hys., Sacramento, grading, concrete paving 1.3 mi. 3 St., San Francisco Co.; grading, plant mix surfacing 13 mi. Santa Barbara Co. C. H. Purcell, state hy. engr.

Bids Asked

†**Texas**—U. S. Eng., Albuquerque, N. M., grading, asphalt and concrete paving, El Paso Co. $200,000. Plans deposit $50.

Ia., Fort Madison—Bd. Supervs. Lee Co. and P. A. Blackford, executor Alexander Coleman Estate, received no bids Oct. 1, impry. 1.5 mi. road. $45,000. CD 9/16—ENR 9/24.

Mo., Clayton (St. Louis P. O.)—A. H. Kerth, mayor, returned unopened bids to have been opened Sept. 22, concrete resurfacing Bonhomme Ave. and Wydown Blvd. A. W. Elbring, City Hall, 10 N. Bemiston St., engr.

LOW BIDDERS

California—State Div. Hys., 808 State Bldg., Los Angeles, Sept. 24, impry. 0.9 mi. Los Angeles Co., from Griffith Co., 502 Los Angeles Railway Bldg., Los Angeles, **$46,345.** CD 9/4—ENR 9/10.

D. C., Wash.—District Comrs., District Bldg., Sept. 25, repairing asphaltic pavements and concrete bases, involving 1,500 tons asphaltic materials, 2,000 cu.yd. concrete base, from McGuire & Rolfe, 1401 1 St. S.E. **$130,657.** CD 9/22.

★**Georgia**—State Hy. Dpt., Atlanta, Oct. 2, impry. 7.113 mi. Franklin Co., from W. L. Cobb, Inc., Decatur, **$208,811***1.722 mi. Bibb Co., from Bowen Constr. Co., Macon, **$238,765***5.793 mi. Macon Co. and 1.627 mi. Richmond Co., from Claussen-Lawrence Constr. Co., Augusta, **$142,678** and **$27,049** respectively***6.21 mi. Monroe Co., from M. J. Carroll Contg. Co., Inc., Leesburg, Fla., **$228,174***5.063 mi. Mitchell Co., from Hugh McMath Constr. Co., Brennan Rd., Columbus, **$135,398***5.953 mi. Macon Co., from Whitley Constr. Co., La Grange, **$145,997.** CD 9/29.

Idaho—State Dpt. Hys., Boise, Sept. 25, grading, draining, crushed rock surfacing

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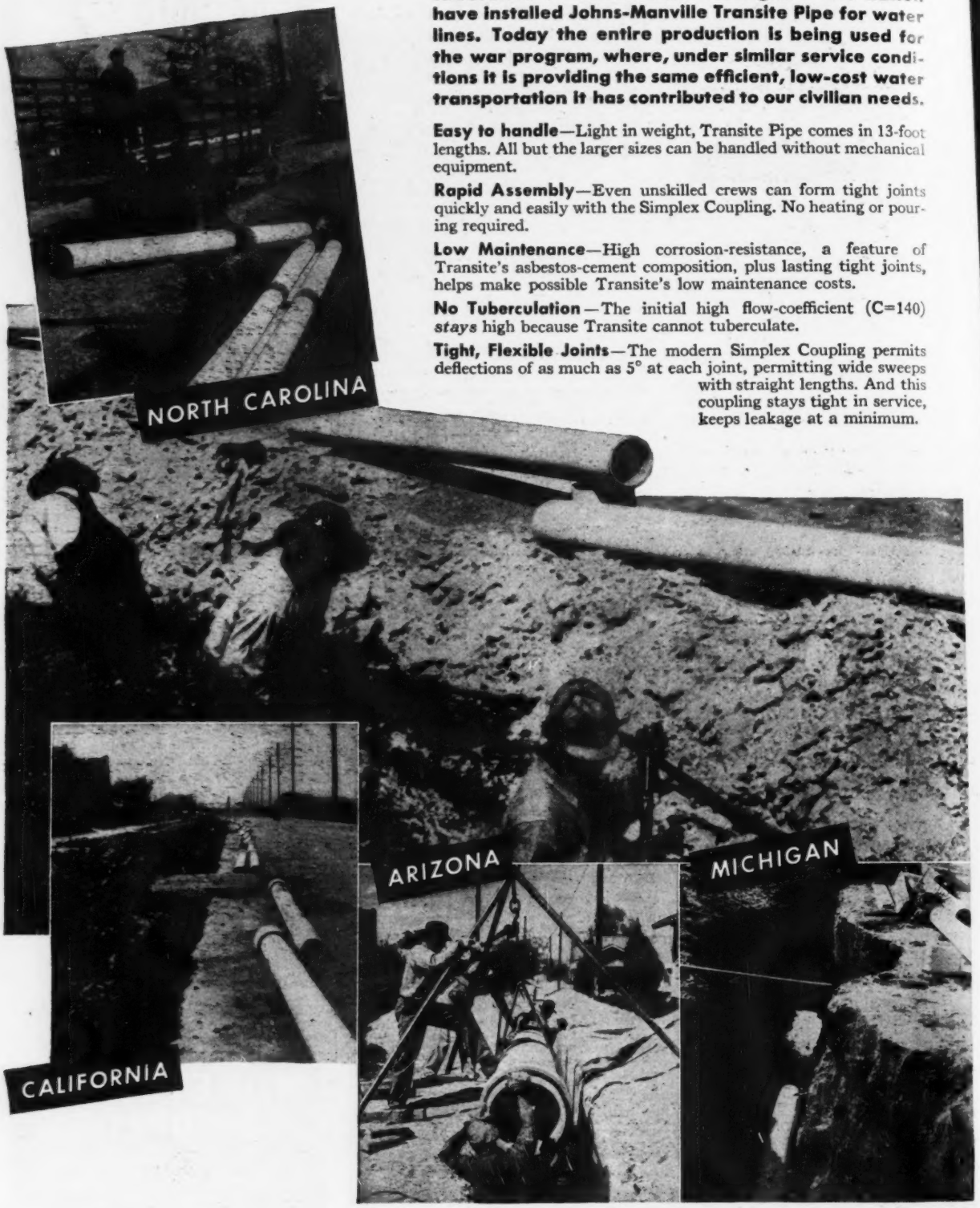

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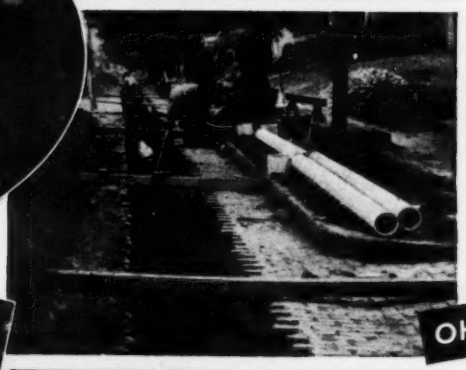

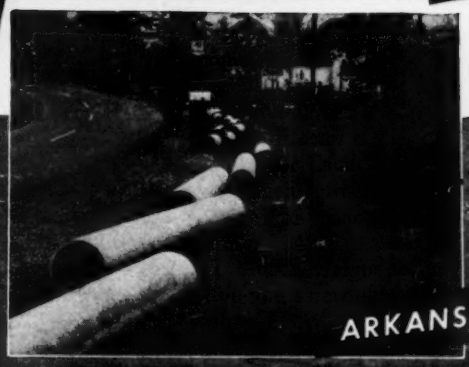

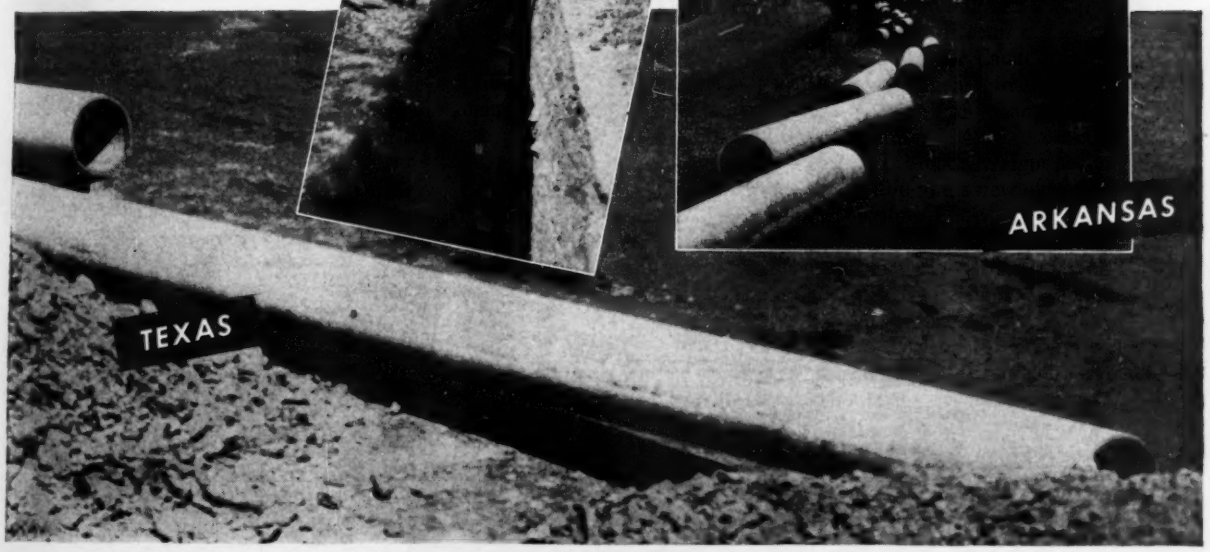

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STREETS, etc. (Low Bidders, ...d.)

1.415 mi. Coeur d'Alene-Yellowst... Park Hy. from Teddy Mine to Big Creek ... Colonial Constr. Co., 326 1 St., Spok... $123,988. T. M. Hally, Boise, engr.

Michigan—State Hy. Dpt., L...ng, Sept. 23, imprv. road, Wayne and Was...aw Coun-ties, from Gerritt Posthumus, Pic...n, $27,868. CD 9/16.

Low Bidders

Missouri—State Hy. Comn., Jefferson City, Oct. 2, from Boone & Herbst, Clay...n, imprv. 6,734 sq. yd., **$57,035,** 0.417 mi. ...831, 377 tons asphaltic concrete alt. 1, 3,... tons aggregate **$53,947,** all St. Louis Co. CD 9/2... ENR 9/24.

★**New York**—State Dpt. P. Wks., Div. Hys., Albany, Oct. 2, imprv. 2.73 mi. Nassau Co., from Goods Roads Eng. & Cont... Inc., Wantagh, **$171,835,** est. $18...***5.75 mi. Nassau and Suffolk Counties, from Harris Grand, 888 Montgomery St., Brooklyn, **$286,117,** est. $314,610***4.74 mi. Albany Co., from Arute Bros., Inc., 560 S. Main St., New Britain, Conn., **$318,166,** est. $350,...***5.6 mi. Onondaga Co., from D. W. Winkelman Co., Heffernan Bldg., Syracuse, **$46,966,** est. $47,843. CD 9/16—ENR 9/24.

Oregon—State Hy. Comn., Salem, Oct. 1, imprv. roads, Marion Co., from Warren Northwest Co., Inc., 102 and Warren Rd., Portland, **$309,990***Tillamook Co., from F. C. Feldschau, Gen. Delivery, Tillamook, **$70,304***Linn Co., from H. C. Walling, c/o Salem Supply Co., E. Hoyt St., Salem, **$31,563***road Klamath and Lane Counties, from Eugene Sand & Gravel Co., General Delivery, Eugene, **$14,304.** Received nine bids rock production in Baker, Harney, Klamath, Umatilla and Wallawa Counties. CD 9/22.

Pennsylvania—At office I. L. Hughes, secy. Hys., Harrisburg, Oct. 2, imprv. 6,976 ft. York Co., from G. A. & F. M. Wayman, Dallastown, **$400,580***3,602 ft. Mercer and Crawford Counties, from H. T. Osburn & Co., 407 Trust Co. Bldg., Franklin, **$106,757***...67 ft. Wayne Co., from H. W. Shaull & Son, Mechanicsburg, **$83,829***3,706 ft. Wayne Co., from Pine Brook Iron Wks., 105-109 Middle St., Scranton, **$95,565.** Received no bids imprv. 2,684 ft. Erie Co. and 5,668 ft. Lackawanna and Luzerne Counties, will readvertise. CD 9/5—ENR 10/1.

†**Texas**—U. S. Eng., 231 W. Main St., Denison, highway relocation (257-43-51), Grayson Co., from Austin Bridge Co., 1813 Clarence St., Dallas, Tex., under **$500,000.**

†**Texas**—U. S. Eng., Fort Sam Houston, about Sept. 28, surfacing, asphaltic paving Spec. 42-433, Bexar Co., from Colglazier & Hoff, 326 Seguin Rd., San Antonio. **$50,000-$100,000.** CD 9/21.

†**Texas**—U. S. Eng., Fort Sam Houston, about Sept. 28, streets, walks Spec. 42-483, Kinney Co., from W. C. Evans, 1030 W. Olmos St., San Antonio, under **$50,000.** CD 9/22, under BA.

Washington—State Hy. Dpt., Olympia, Sept. 29, imprv. 1.2 mi. Snohomish Co., from E. J. Templeton, 902 Hoyt St., Everett, **$73,631.** CD 9/17.

CONTRACTS AWARDED

†**Florida**—U. S. Eng., U. S. Courthouse & Customhouse, road, Franklin Co., to Coggin & Deermont, Chipley, under **$50,000.**

Iowa—State Hy. Comn., Ames, grading 1.54 mi. Woodbury Co., to Clark Constr. Co., Merrill, **$30,862.** Awarded 9/21. CD—9/29—ENR 10/1.

Ia., Guthrie Center—O. Koshi, aud. Guthrie Co., graveling roads, to Erwin Clark, 2330 E. Grand St., Des Moines, and Bagley Constr. Co., Bagley. **$25,000.**

La., Lake Charles—Paving streets, sidewalks, to G. L. Riling, Lake Charles. Bids 9/23.

★†**Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, roads and walks, Tosco Co., to A. Jeffery, 317 Lyons St., Saginaw, less than **$1,000,000.**

Mississippi—State Hy. Comn., Jackson, imprv. 2.954 mi. Wilkinson and Amite Counties, to Shuptrine Constr. Co., Centerville, **$279,876,** est. $90,000. Bids 9/29. Received no bids Sept. 29, imprv. 2.241 mi. Jackson Co., will readvertise.

†**Mississippi**—U. S. Eng., Postoffice & Courthouse, Vicksburg, roads, culverts, reallocation bldgs., Hinds Co., to J. W. Jarett & Son, Kosciusko. Est. **$50,000-$100,000.** Bids 9/22.

★**Nebraska**—Dpt. Roads & Irrigation, Lincoln, imprv. 5.7 mi. Lancaster Co., to Abel Constr. Co., 900 N. 16 St., and Dobson & Robinson, 823 1st Natl. Bank Bldg., both Lincoln, **$545,358.** Bids 9/3. CD 9/9—ENR 9/17, under LB.

†**Nebraska**—U. S. Eng., 10 E. 17 St., Kansas City., Mo., roads, drainage and fencing, Thayer Co., to G. H. Lowe, 417 1 Ave. S.E., Cedar Rapids, Ia., **$100,000-$500,000.**

N. J., Camden—Camden Co., removing car tracks, repaving streets. **WPA. $50,980.** D. Haining, 930 Atlantic Ave., Atlantic City, WPA engr.

STREETS, etc. (Contracts Awarded, Cont'd.)

N. J., New Brunswick—Middlesex Co., removing car tracks, repaving streets. **WPA. $53,501.** J. H. Weitzen, Chestnut and Hamilton Aves., Trenton, WPA engr.

N. J., Somerville—Somerset Co., removing car tracks, repaving streets. **WPA. $69,780.** J. H. Weitzen, Chestnut and Hamilton Aves., Trenton, WPA engr.

†**North Carolina**—U. S. Eng.* Charlotte, addnl. road work, grading, surfacing, Union Co., to R. B. Tyler Co., Monroe. Bids 9/24.

Ohio—State Hy. Dpt., Columbus, imprv. 3.735 mi. Huron Co. and 3.969 mi. Medina Co., to Ohio Road Imprvt. Co., 341 Chamber of Commerce Bldg., Columbus, **$48,750** and **$46,316** est. $50,400 and $49,700 respectively***1.956 mi. Mahoning Co., to Tri-State Asphalt Corp., South Bway., Martins Ferry, **$25,304,** est. $25,480***2.021 mi. Summit Co., to The McCourt Constr. Co., 1000 Hazel St., Akron, **$37,185,** est. **$41,400.** Grand total $157,555. Received no bids imprv. 4.978 mi. Defiance Co. CD 9/17—ENR 9/24.

O., Struthers—Mahoning Co., Youngstown, resurfacing Route 18 and 616, to Tri-State Asphalt Corp., Martins Ferry, **$25,304.** Est. $25,480.

†**Texas**—U. S. Eng., Fort Sam Houston, roads, walks, asphalt paving, Spec. 42-410, to W. G. Drummond Co., View, under **$50,000.** Bids about 9/24.

†**Texas**—U. S. Eng., Fort Sam Houston, asphalt roads, walks, area fencing, to J. O. Mack, Jr., Gunter Hotel, San Antonio, **$50,000-$100,000.**

Texas—State Hy. Dpt., Austin, imprv. 4.925 mi. Hastrop Co., to Ben Sira & Co., 3901 Elm St., Dallas, **$123,298.** Est. $120,000. Bids 10/2. CD 9/23.

Tex., Dallas—Dallas Co., concrete paving Long Dr. between Holmes and Telephone Rds., **WPA.** Approx. **$64,000.** R. S. Pearson & H. T. Dreyfus, Courthouse, engrs.

†**Texas**—U. S. Eng., 231 W. Main St., Denison, area grading, Sol-257-43-75, Gray Co., to Plains Constr. Co., Pampa, **$50,000-$100,000.**

†**Washington**—U. S. Eng., 810 3 Ave., Seattle, concrete paving, Pierce Co., to A. G. Holman, 112 N. Franklin St., Olympia, under **$50,000.**

★**West Virginia**—State Road Comm., Charleston, imprv. 0.385 mi. Cabell Co., to Smith Constr. Co., Huntington, **$35,875***1.458 mi. and 2.775 mi. Kanawha Co., to Stellhorn & Beightler, 2978 High St., Columbus, O., **$239,554** and **$454,207** respectively***1.821 mi. McDowell Co., to McHugh Bros., 1828 Crescent Dr., Springfield, O., **$113,389.** Grand total $843,025. Bids 9/29. CD 9/21—ENR 9/24.

★**Alberta — Provincial Govt.**, Edmonton, grading, graveling 600 mi. roads to serve industries at Fort McMurray, through Plamondon, around Bear Lake from Grimshaw, to Calling Lake from Athabaska and around Red Deer and Rocky Mountain House, own forces. **$4,850,000.** Dpt. P. Wks., Edmonton, engrs.

Alta., Wainwright—Dpt. National Defense, Ottawa, Ont., grading area at Brigade Group Camp, to F. R. Gibbs, Medicine Hat, **$45,000.**

Ont., Camp Borden—Dpt. Natl. Defense, Ottawa, grading area, Military Camp, to Brennan Paving Co., Ltd., 400 Gage Ave. N., Hamilton, **$44,000.**

Quebec — Provincial Dpt. Roads, Quebec City, concrete paving Sir Wilfred Laurier Hy. between St. Hyacinthe le Confessor and St. Rosalie, to Eastern Canada Constr. Co., Ltd., 548 King St. W., Sherbrooke, **$32,500.**

Quebec — Provincial Govt., Quebec City, grading, bituminous concrete surfacing 1¾ mi. at Ancienne Lorette, to Union des Carrieres et Pavages, Ltd., 48 2 Ave., Quebec City, **$62,000.**

Que., Cap de la Madeleine — Municipality, F. Beaunier, clk., 6,000 sq. yd. rein.-con. pavement, St. Lawrence and Steel Sts., to Page Equipment & Constr. Co., Ltd., 1497 Craig St., Three Rivers. Est. **$25,000.**

Que., Valcartier—Dpt. Natl. Defense, Ottawa, Ont., surfacing parade grounds, Army Camp, to Union Quarries & Paving Co., Ltd., 48 2 Ave., Quebec City, **$37,000.**

EARTHWORK WATERWAYS

PROPOSED WORK

★†**Texas and Louisiana**—Intracoastal Canal Assn., c/o C. S. E. Holland, Corpus Christi, widening, deepening intracoastal canal between Corpus Christi, Tex., and St. Marks, La. **$6,485,000** available for fiscal year 1942-1943.

N. S., Harmony Mills—Nova Scotia Power Comn., Halifax, bids soon dam, etc., consisting head dams, timber crib, gravity concrete and earthen head canal, headworks, etc. $93,000.

BIDS ASKED

Bids Asked October 29

†**La., New Orleans**—U. S. Eng., foot Prytania St., approx. 37,000 cu. yd. earthwork in Mississippi River, Inv. 43-132.

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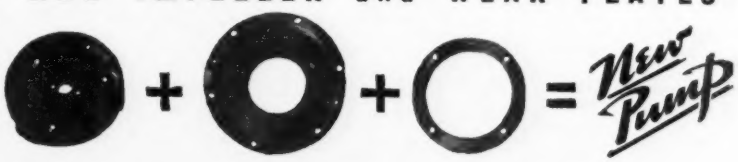

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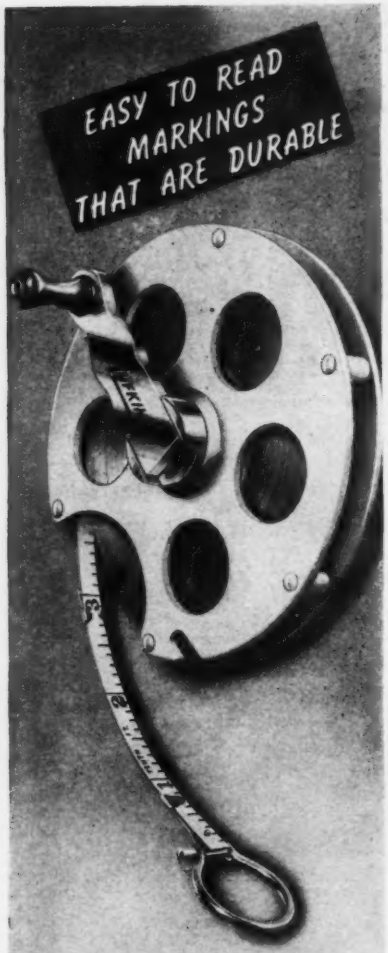

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EARTHWORKS, etc. (Bids Asked, Cont'd.)

Bids Asked October 13

N. Y., Olean—Flood wall in East Riverside Dr., East River St., trestle Allegheny River, South Union St.; removing earth approaches, etc. $200,000. CD 8/4—ENR 8/6.

Bids Asked October 14

†Oklahoma—Bureau Reclamation, Custom House, Denver, Colo., modified portland cement, for Altus Dam, Altus 14X0645 (Reimb), Inv. A-36-506-A.

Alta., New Kathryn—Dominion Govt., Ottawa, Ont., dam. $25,000. Prairie Farm Rehabilitation Bd., 910 McCallum Hill Bldg., Regina, Sask., engrs.

LOW BIDDERS

†Calif., Burbank—Federal Works Agency, 1206 Santee St., Los Angeles, Sept. 29, 2nd sect. Lockheed Channel (storm drain) from Baruch Corp., 625 S. Olive St., Los Angeles, **$148,341.** CD 9/22.

CONTRACTS AWARDED

†Arkansas—U. S. Eng., P. O. Box 97, Memphis, Tenn., earthwork, No. 1092-43-85F, Lee Co., to Atlas Constr. Co., Waxahachie, Tex. Est. under **$50,000.** Bids 9/22.

California—Pacific Gas & Electric Co., 245 Market St., San Francisco, repairing Chute Dam on South Fork American River. Owner builds. **$22,500.** CD 9/8—ENR 9/10.

†Maine—U. S. Eng., 31 St. James Ave., Boston, Mass., earthwork, Penobscot Co., to J. R. Cianchette, 120 Main St., Pittsfield. Est. **$25,000-$50,000.** CD 9/24—ENR 10/1.

†Massachusetts—U. S. Eng., Park Sq. Bldg., Boston, dredging, Inv. 175-43-Neg 64, Bristol Co., to Bay State Dredging & Contg. Co., 62 Condor St., East Boston. Est. under **$50,000.**

†Mass., South Boston—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., earth filling at reserved channel basin, Spec. 10946, to E. M. Carriere, 134 Whitford St., Roslindale. **$166,000.** Awarded 9/19.

†Washington—U. S. Eng., Pittock Blk., Portland, Ore., dam repair work, Walla Walla Co., to Leonard & Slate, Multnomah, Ore., under **$50,000.**

★ **†Washington**—U. S. Eng., Pittock Blk., Portland, Ore., **drainage sys., Walla Walla** Co., to Leonard & Slate, Multnomah, Ore. **$1,000,000-$5,000,000.**

Ont., Atikokan—Steep Rock Iron Mines, Ltd., 25 W. King St., Toronto, drainage Steep Rock Lake, own forces. Over **$100,000.** W. Samuel, 25 W. King St., Toronto, engr.

UNCLASSIFIED

PROPOSED WORK

★ **†Idaho** — IMPROVEMENTS — Civil Aeronautics Admin., Boeing Field, Seattle, Wash., imprvs. $761,000.

★ **†Ia., Burlington**—AIRPORT—M. A. Conrad, mayor, $150,000 bond, election Oct. 15, airport. Est. $1,000,000. CAA. CD 9/29—ENR 10/1.

La., Shreveport—ELECTRIC SYSTEM IMPROVEMENTS, etc.—Louisiana Pub. Utilities Co., c/o Dallas Rupe & Son, Kirby Bldg., Dallas, Tex., imprv. electric, water, gas sys. and ice manufacturing plants.

★ **Ia., Waterloo**—AIRPORT—R. B. Slippy, mayor, $450,000 bond, election Nov. 3, airport. Est. $750,000.

La., Morgan City—CASINGS—Union Oil Co., Commerce Bldg., Houston, Tex., 3 in. casings (pipes) stakes, detectors, etc.

Minn., Mankato—AIRPORT—F. W. Bates, city clk., $150,000 bond election Nov. 3, airport. Over $250,000. CD 7/20—ENR 7/23.

★ **†Mississippi**—CLEARING, etc.—Civil Aeronautics Admin., 14 St. between E St. and Constitution Ave. N.W., Wash., D. C., imprvs., incl. clearing, grubbing, drain and turf. $550,000 addnl. authorized.

★ **†Nebraska**—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, preliminary surveys imprvs., Holt Co. Over $2,000,000.

★ **†Nebraska** — IMPROVEMENTS — U. S. Eng., 1709 Jackson St., Omaha, imprvs., Dodge Co. Over $2,000,000.

†Nebraska—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, engineer-architect services by R. J. Tipton Co., 1st Natl. Bank Bldg., Denver, Colo., imprvs., Hall Co. CD 9/11—ENR 9/17.

★ **Neb., Fairmont**—AIR FORCE INSTALLATION—U. S. Eng., 601 Davidson Bldg., Kansas City, Mo., air force installation, $2,000,000.

†Ore., Salem—AIRPORT—Civil Aeronautics Admin., Boeing Field, Seattle, Wash., complete airport, paving runways, etc. $385,000.

★ **Texas and West Virginia**—PIPELINE CARRIER—Hope Natural Gas Co., Clarksburg, W. Va., 1,000 mi. natural gas pipeline carrier, 20 in. steel welded joint pipe. $[illegible],000,000

†Texas—GASOLINE FUELING SYSTEM—U. S. Eng., Albuquerque, N. M., engineer-architect services by Haynes & Stone, Parkhill, Voelcker & Dixon, Associates, Lubbock, gasoline fueling sys., Presidio Co.

†Texas — ELECTRICAL DISTRIBUTION—U. S. Eng., 231 W. Main St., Denison, outside overhead electrical distr. sys., Gray Co. Over $25,000.

Tex., Corpus Christi—PIPELINE RELOCATION—Sinclair Refining Co., Fair Bldg., Fort Worth, relocating 52 mi. 8 in. steel pipeline carrier from Gray Co. to coast area, $100,000 or more.

Tex., Jacksonville—HANGARS—A. E. Gasner, city mgr., 12 hangars. $75,000.

†Wash., Aberdeen—AIRPORT—Civil Aeronautics Admin, Boeing Field, Seattle, airport, Grays Harbor Co. $450,000.

†Pacific Northwest—FIRE ALARM SYSTEM—U. S. Eng., 810-3 Ave., Seattle, Wash., fire alarm sys.

Ont., Fort Erie—WELL SINKING, etc.—Lincoln Natural Gas Ltd., Fort Erie, well sinking, piping $40,000.

Ont., Galt—LOADING PLATFORM, etc.—Babcock-Wilcox Ltd., 64 S. Grand St., loading platform, retaining wall, etc. $25,000.

Ont., Goderich (Sky Harbour)—CLEARING, etc.—Secretary Dpt. Transport, Ottawa, bids soon clearing, grubbing, smoothing, grading, drainage, hardsurfaced runways, taxistrips, at E.F.T. School 12. $175,000.

Ont., Port Arthur—ORE LOADING DOCK—Canadian National R. R., B. Wheelwright, ch. engr. (Central Region), Toronto, Ont., ore loading dock. $30,000.

BIDS ASKED

Bids Asked October 15

Ill., Chicago—STATION EQUIPMENT—City at office P. Harrington, comr. Subways & Superhighways, 20 N. Wacker Dr., station equip., Contr. T-5, Orders 2 and 3. Extended date. Plans deposit $25. CD 9/23—ENR 10/1.

†North Carolina—AIRPORT—Fairchild Aircraft Div. Fairchild & Airplane Corp., Burlington, airport driveways, parking areas, 235 cu. yd. grading, 67,000 cu. yd. pavement, Alamance Co. Plans deposit $25. Linberg Engineers, Burlington, engrs.

Bids Asked October 19

†California—ELEVATING HOPPER TOWER—Bureau Reclamation, Denver, Colo., elevating-hopper tower with crane, consisting motor-driven trolley, 8 ton hoist, accessory equip. for fish trap at Keswick Dam, Kennett Div., Central Valley Proj., Spec. 1670-D.

Bids Asked October 20

†Washington — PLANTING — Pub. Bldgs. Admin., North Interior Bldg., Wash., D. C., planting.

Bids Asked October 22

†Washington—AIRPORT— Civil Aeronautics Admin., 7th Regional Office, Boeing Field, Seattle, Seattle-Tacoma Airport, Inv. 7-514; adv. ENR 10/8.

Bids Asked

†Connecticut—ELECTRIC DISTRIBUTION SYSTEM—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., (from selected bidders) electric distr. sys., wiring conduits, etc., New Haven, Co.

†Texas — ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., 25 St. and Avenue F, Galveston, outside overhead electrical distr. sys., over $25,000; utility sys., incl. natural gas, water and sanitary sewerage sys., over $65,000, both Harris Co. Plans deposit $50 each project.

†Texas — ELECTRICAL SYSTEM — U. S. Eng., 231 W. Main St., Denison, outside overhead electric distr. sys. Over $25,000. Plans deposit $25.

†Texas—NATURAL GAS FACILITIES, etc. —U. S. Eng., Fort Sam Houston, natural gas facilities, over $25,000; sanitary sewerage facilities, over $25,000; water supply and distr. facilities, over $25,000; outside overhead electrical distr. sys., over $25,000, all Spec. 42-281 in part. Plans deposit $25 each project.

LOW BIDDERS

†California—ELECTRICAL DISTRIBUTION—U. S. Eng., 751 S. Figueroa St., Los Angeles, Sept. 28, electrical distr. sys., No. 280, Riverside Co., from General Constr. Co. & J. Walter Johnson, 5205 Hollywood Blvd., Los Angeles, under **$100,000.**

†California—IMPROVEMENTS—U. S. Eng., 751 S. Figueroa St., Los Angeles, Sept. 25, imprvs., No. 270, San Bernardino Co., from R. V. Mead, 633 S. La Brea Ave., Los Angeles, under **$100,000.**

†California—UTILITIES—U. S. Eng., 1209 8 St., Sacramento, Sept. 26, utilities, Sacramento Co., from M. R. Carpenter, 907 Front St., Sacramento, under **$50,000.**

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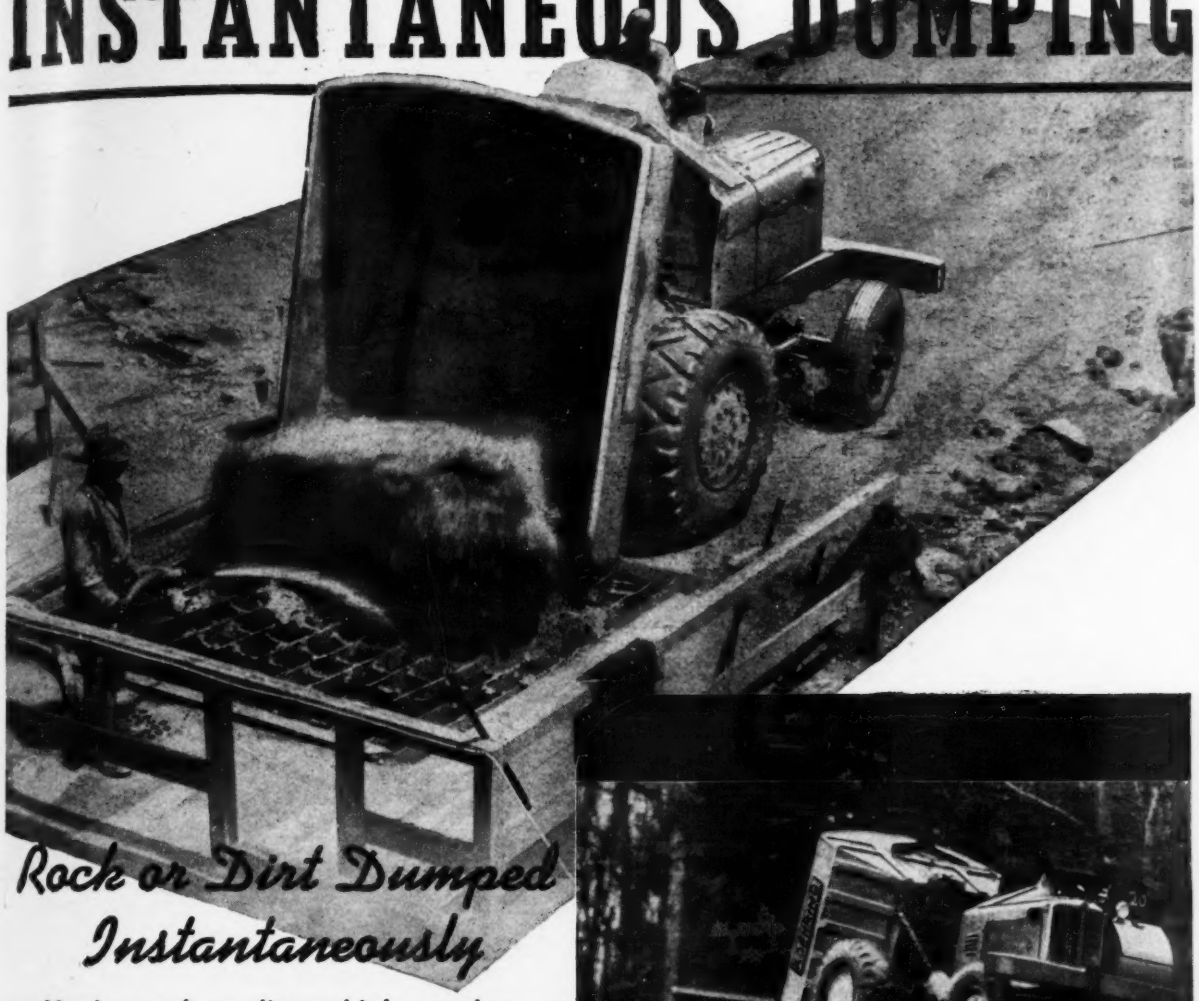

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2. **Cutless rubber bearings.** (No close-fitting, metal-to-metal bearings which might be damaged by sand or grit.)
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4. **Protection of water supply against contamination** by oil or grease as pump is water lubricated.
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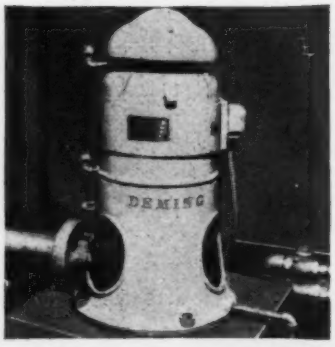

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UNCLASSIFIED, etc. (Proposed Work, Cont'd.)

†**California** — WHARF — U. S. Eng., 751 S. Figueroa St., Los Angeles, Sept. 23, timber wharf, etc., No. 257, San Diego Co., from Carlo Bongiovanhi, 2561 Canyon Dr., Beverly Hills, under **$100,000.**

†**D. C., Wash.**—MELTING FURNACES, etc.—Dpt. Commerce, Bureau Standards, Connecticut Ave. at Upton Ave. N.W., Sept. 25, 2 melting furnaces, 12 pot arches and flues, from William Hughes, 1239 24 St. N.W., **$29,800.**

†**Louisiana**—ELECTRICAL DISTRIBUTION SYSTEM—U. S. Eng., foot of Prytania St., New Orleans, Sept. 25, electric distr. sys., Inv. 43-91, from National Electric Co., 415 Dryades St., New Orleans.

†**Louisiana**—SITE IMPROVEMENTS — Pub. Housing Auth., NHA., Electric Bldg., 7 and Taylor Sts., Fort Worth, Tex., site imprv., Project 16034, from F. D. Welch, 503 1st Natl. Bank Bldg., Shreveport, **$129,100.**

†**Nevada**—Civil Aeronautics Admin., 1500 4 St., Santa Monica, Calif., imprvs. Por. 63-151, Humbolt Co., from C. E. Nelson, Logan, Utah, **$300,966.** CD 9/23—ENR 10/1.

†**New York**—LIGHTING SYSTEM—U. S. Eng., 960 Ellicott Square Bldg., Buffalo, Sept. 30, night lighting sys., St. Lawrence Co., from E. Zwicker Corp., 415 Lexington Ave., New York. CD 9/22—ENR 9/24.

†**Texas**—FIRE ALARM SYSTEM—U. S. Eng., Fort Sam Houston, Sept. 14, fire alarm sys., Spec. 42-391 (P1-11) Tarrant Co., from Empire Electric Co., 1015 W. Rosedale St., Fort Worth.

†**Texas** — IMPROVEMENTS — U. S. Eng., Fort Sam Houston, imprvs., Bexar Co., from J. McNeel, 1520 Main Ave., San Antonio.

†**Texas**—STEAM DISTRIBUTION SYSTEM, etc.—U. S. Eng., Fort Sam Houston, heating facilities, incl. gas fired unit heaters and steam distr., Spec. 42-431, Bexar Co., from Farwell Co., 710 Builders Exchange Bldg., San Antonio. CD 9/16.

CONTRACTS AWARDED

★†**Arizona**—IMPROVEMENTS—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., imprvs., No. 256, Yuma Co., to Clyde W. Wood, 208 W. 8 St., Los Angeles, Calif., less than **$1,000,000.** Bids 9/18, awarded 9/23. CD 9/28—ENR 10/1, under LB.

★†**California**—IMPROVEMENTS—U. S. Eng., 751 S. Figueroa St., Los Angeles, imprvs., Spec. 263, Riverside Co., to Rhoades Bros. and Shofner, 3869 Medford St., Los Angeles. Est. over **$500,000.** Awarded 9/30. CD 9/28—ENR 10/1.

†**California**—BOILERS—U. S. Eng., 1209 8 St., Sacramento, constructing boilers, Lassen Co., to Beeson Bros. Supply Co., 1000 N. Alhambra Ave., Los Angeles. Est. under **$50,000.**

†**California**—IMPROVEMENTS—U. S. Eng., 74 New Montgomery St., San Francisco, imprvs., Alameda Co., to Fredrickson & Watson Constr. Co., 873 81 Ave., Oakland, and Fredrickson Bros., 2159 65 St., Emeryville. Awarded 10/1.

†**California** — DECONTAMINATION STATIONS—U. S. Eng., 74 New Montgomery St., San Francisco, decontamination stations, Marin Co., to J. B. Allen, 1012 Elm St., San Carlos. Awarded 9/24.

†**California**—GASOLINE FUELING SYSTEM—U. S. Eng., 1209 8 St., Sacramento, gasoline fueling sys. addn., Merced Co., to Flotation Systems, Inc., 4031 Goodwin Ave., Los Angeles, under **$50,000.**

★**California** — IMPROVEMENTS — H. J. Kaiser Co., 1522 Latham Sq. Bldg., Oakland, ferry terminal bldg. and pneumatic toll repair shop, to A. J. Hopper, 243 Langton St., San Francisco***women's locker room, to D. W. Nicholson, 1701 San Leandro Blvd., San Leandro***steel stair tower to plate shop, administration bldg., warehouse, women's bldgs. Owner builds. Rejected bids Sept. 14, boiler assembly bldg., new bids from selected list contractors. Abandoned construction office bldg. CD 9/15 and 9/22 and 9/24.

California — IMPROVEMENTS — Industrial Company, imprvs., etc., to Macdonald & Kahn, Inc., 200 Financial Center Bldg., San Francisco; electrical contract, to Enterprise Electric Wks., 1164 Mission St., San Francisco.

†**California**—OIL BUNKERING SYSTEM—U. S. Eng., 74 New Montgomery St., San Francisco, oil bunkering sys., Alameda Co., to Cory & Joslin, Inc., 50 Hawthorne St., San Francisco. Awarded 9/28.

†**California**—RAILROAD HOLD YARD—U. S. Eng., 74 New Montgomery St., San Francisco, railroad hold yard, Contra Costa Co., to S. B. Lane, 845 Pine St., San Francisco. Awarded 9/29.

†**California**—RAILROAD HOLD YARD—U. S. Eng., 74 New Montgomery St., San Francisco, railroad hold yard, San Mateo Co., to S. B. Lane, 845 Pine St., San Francisco. Awarded 9/29.

†**California**—RAILROAD TRACK RELOCATION, etc.—U. S. Eng., 74 New Montgomery St., San Francisco, relocating, constructing railroad tracks and crossovers, Contra Costa Co., to Atchison, Topeka & Santa Fe Railway Co., 560 S. Main St., Los Angeles.

Calif., Sausalito — FERRY SLIP — W. A. Bechtel Co., 155 Sansome St., San Francisco, ferry slip, to Raymond Concrete Pile Co., 333 New Montgomery St., San Francisco.

†**Connecticut** — FUELING SYSTEM — U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., A.C. fueling sys., fuel facilities, etc., Hartford Co., to Ley Constr. Co., 215 Main St., Springfield, Mass. Est. $25,000. Bids 8/21.

★†**Connecticut**—HANGAR—Industrial Company, service and maintenance hangar, to Edwin Moss & Son, Inc., 555 Pleasant St., Bridgeport; electrical work, to Eastern Electric Constr. Co., 40 Summerfield Ave., Bridgeport, Conn. Est. **$500.000,** Federally financed, Albert Kahn Associates, 345 Centre Bldg., Detroit, Mich., engr. CD 9/10—ENR 9/17.

†**Connecticut**—RAILROAD SIDING — U. S. Eng., Industrial Trust Bldg., Providence, R. I., railroad siding, No. 699-43-72, Hartford Co., to Alex Jarvis Co., Center St., South Manchester. Est. under **$50,000.** CD 9/29.

†**Connecticut**—SERVICE UTILITIES—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., service utilities, No. 699-43-62, Hartford Co., to Alexander Jarvis Co., 416 Center St., South Manchester. Est. over **$25,000.** Bids 9/23.

†**Florida**—AIR CONDITIONING—U. S. Eng., Court House, Jacksonville, air conditioning bldgs., Inv. Neg. F.M. 43-4, Lee Co., to W. B. Haggerty, Inc., 805 Morgan Bldg., Tampa, Fla., under **$50,000.** Awarded 9/25.

†**Florida** — CLEARING, GRUBBING, etc.—U. S. Courthouse & Post Office, Jacksonville, clearing, grubbing, grading, draining, paving runways, taxiways, hardstands, installing ducts, Marion Co., to L. J. Cobb, Dunnellon, **$100,000-$500,000.**

†**Florida**—EXPERIMENTAL FUELING SYSTEM—U. S. Eng., Court House, Jacksonville, experimental fueling sys., Neg. Jax 43-215, Dade Co., to Aqua Systems, Inc., 384 Gerald Ave., New York, N. Y., under **$50,000.** Awarded 9/26.

†**Florida**—GAS STORAGE, etc.—U. S. Eng., Court House, Jacksonville, a.c. gas storage and fueling sys., Dade Co., Neg.-Jax. 43-229, to Aqua Systems, Inc., 385 Gerard Ave., New York City, N. Y., under **$100,000.** Awarded 9/26.

†**Florida**—IMPROVEMENTS—U. S. Eng., Court House, Jacksonville, imprvs., inv. Neg. Jax. 43-260, Pasco Co., to Polk Constr. Co., Lakeland, under **$500,000.** Awarded 9/25.

†**Florida** — SPRIGGING and SEEDING — U. S. Eng., Court House, Jacksonville, sprigging and seeding road shoulders, Inv-Neg B.R. 43-9, Palm Beach Co., to Mike Blank Nursery, Delray Beach, under **$50,000.** Awarded 9/21.

†**Kansas**—FERTILIZING, etc.—U. S. Eng., Topeka, fertilizing, seeding, Shawnee Co., to Kansas Landscape & Nursery Co., Topeka, under **$50,000.**

†**Kentucky** — GASOLINE STORAGE, etc.—U. S. Eng., Federal Bldg., Louisville, gasoline storage and fueling sys. addn., Jefferson Co., to Aqua Systems, Inc., 385 Gerard Ave., New York, N. Y., under **$50,000.**

†**Louisiana**—IMPROVEMENTS—U. S. Eng., foot of Prytania St., New Orleans, imprvs., to T. W. Kleinpeter, 4047 Hatcher Dr., Baton Rouge.

†**Maine** — WHARF — Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., timber-concrete wharf, to James B. Rendle Co., 1 Salem St., Malden, Mass., **$50,000-$100,000.**

†**Massachusetts** — FACILITIES — U. S. Eng., Park Sq. Bldg., Boston, facilities, incl. platform, construction work, 175-43-NEG 92, Suffolk Co., to Lappin Brothers, Inc., 7 Irving St., Malden. Est. under **$50,000.**

★†**Michigan**—AIRFIELDS—U. S. Eng., 700 Union Guardian Bldg., Detroit, airfields, to I. Lawson, Sault Ste. Marie, less than **$1,000,000.**

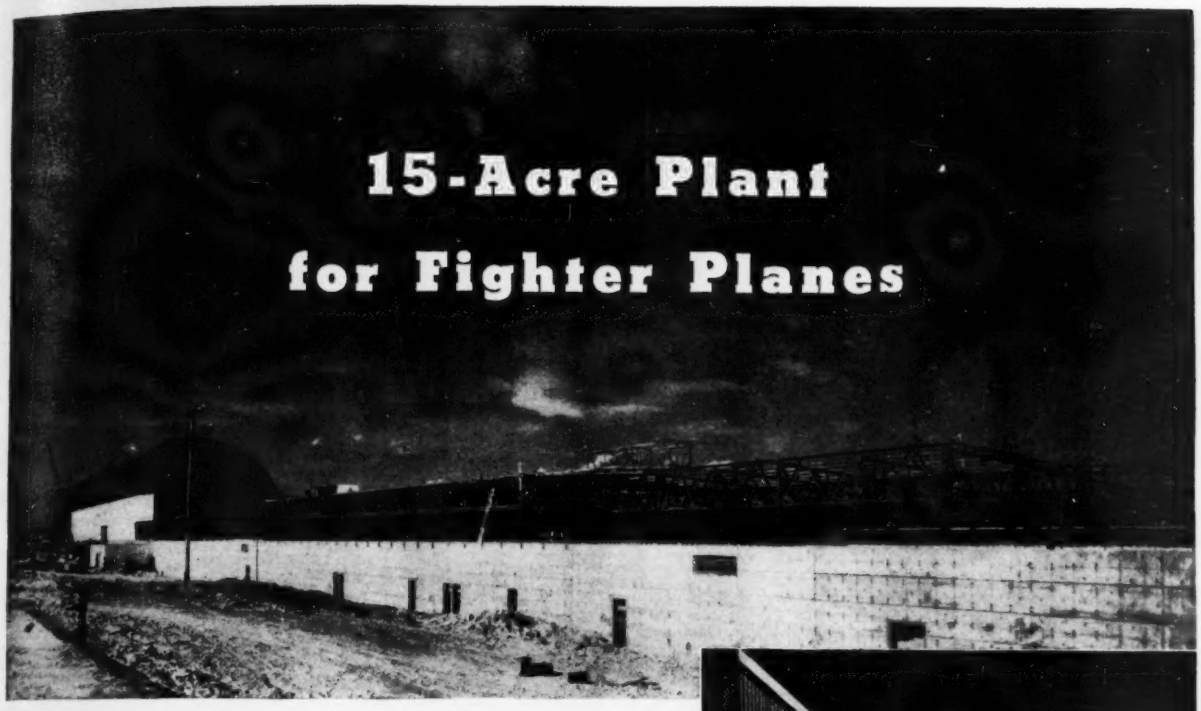
★†**Michigan** — FENCING — U. S. Eng., 700 Union Guardian Bldg., Detroit, fencing, to Cyclone Fence Division, American Steel & Wire Co., 1130 W. Grand Blvd., Detroit, less than **$1,000,000.**

★†**Michigan**—GASOLINE FUELING SYSTEM—U. S. Eng., 700 Union Guardian Bldg., Detroit, gasoline fueling sys., Alpena and Iosco Counties, to Walters Constr. Co. Inc., 37-49 58 St., Woodside, N. Y., less than **$1,000,000.**

★†**Michigan**—NIGHT LIGHTING SYSTEM REMOVAL, etc.—U. S. Eng., 700 Union Guardian Bldg., Detroit, night lighting sys., removal and relaying certain existing cable and furnishing, laying addnl. cables, Macomb Co., to W. D. Gale Co., 7145 Tireman Ave., Detroit, under **$1,000,000.**

†**Minnesota**—HANGARS—U. S. Eng., U. S. Post Office & Customhouse, St. Paul, hangars, Ramsey Co., to Standard Const. Co., Inc., 604 Natl. Bldg., Minneapolis.

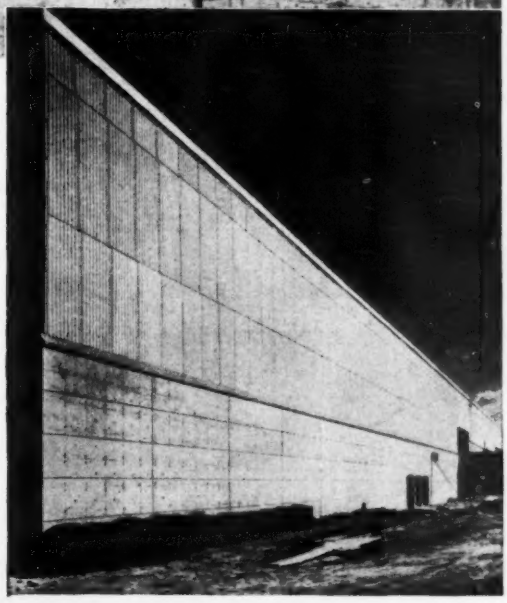
Mississippi — IMPROVEMENTS — Industrial Company, imprvs., bldgs., to Brice Building Co., 215 S. 18 St., Birmingham, Ala., **$110,000.**

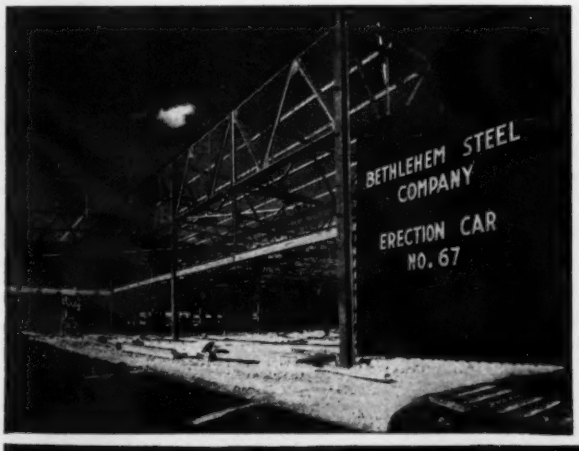


15-Acre Plant for Fighter Planes

Somewhere in America the Sikorsky Plant, shown here, is fast nearing completion. Covering an area of 652,500 sq. ft., this completely windowless, 100 per cent fireproof plant, will soon be turning out large numbers of the new 400 m.p.h., long-range Vought-Sikorsky Corsair fighters for the Navy.

An unusual feature of the Sikorsky Plant is the walls. On the west side of the building, shown above and right, is a bomb-fragment-proof wall, of 10-in. reinforced concrete, 15 ft., 4 in. high. This is designed to provide air-raid protection for employees, as well as protection for emergency hospital, vault, general offices, and other key elements. The other walls of the structure are of corrugated asbestos composition, $\frac{5}{8}$ in. thick, backed up by $1\frac{1}{2}$ in. of insulation. These walls rest on steel girths so that, should a bomb hit, only bays actually demolished need be replaced. Fire curtains are included to prevent the spread of fire to any other section of the plant.





Architects and Engineers: J. Gordon Turnbull, Inc.
Contractors: Clemmer Construction Co.

Construction has provided a 40-ft. ceiling throughout. There are four aisles 1050 ft. long, with 100-ft. spans, and one 450-ft. aisle with a 200-ft. span and two aisles with 100-ft. spans. A cafeteria on the main floor accommodates 600. General offices and storage space are located on a mezzanine which runs along one side of the rectangular structure for a distance of 1000 ft. Fabrication and erection of the 8000 tons of structural steel were carried out by the Bethlehem Steel Company.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

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Digging, hauling and automatic dumping are merged into a continuous operation controlled by one operator. Power requirement is moderate. Maintenance is simple because the wearing parts are few and all easily accessible.

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Write for catalog.

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Sauerman Scraper hauls sand from hill to feed two asphalt mixing plants. One man runs the machine. Fuel cost is 40c per hour.

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UNCLASSIFIED (Contracts Awarded, Cont'd.)

†**Missouri**—ELECTRC DISTRIBUTION—U. S. Eng., P. O. Box 97, Memphis, Tenn., electric distr. sys. and primary switching station, No. 1092-43-72F, Dunklin Co., Mo., to Townsend Co., Jackson, Tenn., $50,000.

†**Montana**—SEEDING—U. S. Engineer Administration Bldg., Fort Peck, seeding, Fergus Co., to W. S. Mather, Lewistown, under $50,000.

★†**Neb., Scribner**—AIR FORCE INSTALLATION—U. S. Eng., 1709 Jackson St., Omaha, air force installation, to Fox Valley Constr. Co., Appleton, Wis., over $2,000,000 cost plus fixed fee basis. CD 10/2.

†**New Hampshire**—CONSTRUCTION—U. S. Eng., 31 St. James Ave., Boston, Mass., miscellaneous construction, Rockingham Co., to L. J. Santucci, Arlington, Mass., under $50,000.

†**New Jersey**—SPRINKLER SYSTEM—U. S. Eng., 120 Wall St., New York, N. Y., installing automatic sprinkler sys., Monmouth Co., to Industrial Automatic Sprinkler Co., 111 John St., New York, N. Y., under $50,000.

†**New Mexico**—CONSTRUCTION—U. S. Eng., Albuquerque, miscellaneous construction, Chaves Co., to Gunnison Pecos Valley Co., Roswell, $100,000-$500,000.

†**New Mexico**—ELECTRICAL DISTRIBUTION—U. S. Eng., Albuquerque, outdoor overhead electrical distr. sys., Curry Co., to Lawrence Electric Const. Co., Amarillo, Tex., $50,000-$100,000.

†**North Carolina**—HANGAR—U. S. Eng., 308 Customhouse, Wilmington, hangar, Durham Co., to Wm. Muirhead Constr. Co. Inc., Durham, $50,000-$100,000.

★†**N. C., Wilmington**—AIR FORCE INSTALLATION—U. S. Eng., 308 Customhouse, Wilmington, construction in connection with air force installation, to F. D. Cline, Fairview Rd., Raleigh, over $2,000,000.

†**Ohio**—CONSTRUCTION—U. S. Eng., Wright Field, Dayton, construction, Montgomery Co., to M. Cornish, Callahan Bldg., Dayton, $100,000-$500,000.

†**Ohio** — LIGHTING — Industrial Company, lighting, to Doan Electric Co., 8718 Euclid Ave., Cleveland. Defense Plant Corp. will finance.

†**Ohio**—SEEDING, etc.—U. S. Eng., U. S. Post Office & Courthouse, Cincinnati, seeding, fertilizing and soil preparation, Franklin Co., to A. J. Baltes, Norwalk, under $50,000.

★†**Ohio**—TRAMRAIL SYSTEMS—U. S. Eng., 700 Union Guardian Bldg., Detroit, Mich., tramrail sys. in rough machine and finish machine shops, Allen Co., to American Monorail Co., 13107 Athens Ave., Cleveland, under $1,000,000.

†**Oregon**—LIGHTING SYSTEM—U. S. Eng., Pittock Blk., Portland, lighting sys., Lake Co., to City Electric Co., Boise, Idaho, under $50,000.

†**South Carolina**—GRADING, etc.—U. S. Eng., North Charleston, grading, drainage, paving, Charleston Co., to R. B. Tyler, 1446 Levering St., Louisville, Ky. Bids 9/26.

†**South Carolina**—IMPROVEMENTS—U. S. Eng., Florence, imprvs., paving, Florence Co., to W. L. Cobb, Decatur, Ga. Bids 9/29.

†**South Carolina** — RAILROAD TRACK YARD—U. S. Eng., 33 Customhouse, Charleston, addnl. railroad track classification yard, Charleston Co., to Plowden & Roberts, Columbia. Bids 9/29.

†**South Dakota**—HEATING SYSTEM—U. S. Eng., 1709 Jackson St., Omaha, Neb., warm air heating sys., Minnehaha Co., to Dakota Builders, Sioux Falls, under $50,000.

†**South Dakota**—MARKING ON RUNWAYS, etc.—U. S. Eng., Administration Bldg., Fort Peck, Mont., marking on runways and taxiways, Pennington Co., to Townsco Contg. Co., 1704 N.W. 6 St., Oklahoma City, Okla., under $50,000.

★†**Tennessee**—IMPROVEMENTS—U. S. Eng., P. O. Box 97, Memphis, imprvs., Shelby Co., to Lehman Roberts Co., 575 N. Front St., Memphis, under $1,000,000.

†**Tennessee**—FIRE ALARM SYSTEM, etc.—U. S. Eng., P. O. Box 97, Memphis, fire alarm sys. and fire prevention watch report, No. 1092-43-81F, Shelby Co., to American District Telegraph Co. W. V. Bldg., Memphis, $50,000-$100,000.

†**Texas**—AIR CONDITIONING—U. S. Eng., 25 St. and Avenue F, Galveston, air-conditioning portion bldgs., to Way Engineering Co., 1901 Caroline St., Houston, under $50,000.

†**Texas**—FACILITIES—U. S. Eng., 25 St. and Avenue F, Galveston, facilities, Webb, Dimmit and Maverick Counties, to H. B. Zachry, Laredo, $100,000-$500,000. CD 9/23—ENR 10/1.

†**Texas**—GREASE RACKS, etc.—U. S. Eng., Fort Sam Houston, addnl. grease racks, Bexar Co., to Roege & Marriott, Frost Bldg., San Antonio, under $50,000.

★†**Texas**—IMPROVEMENTS—Industrial Company addnl. expansion facilities, to W. Horace Williams, 833 Howard Ave., New Orleans, La. $275,000; addnl. expan. facilities, incl. bldgs., underground utilities, to Texas Gulf Const. Co., Galveston, $375,000. Additional to CD 7/20—ENR 7/23, under CA.

UNCLASSIFIED (Contracts Awarded, Cont'd.)

†**Texas**—LIGHTING SYSTEM—U. S. Eng., Fort Sam Houston, outside overhead night lighting distr. sys., Spec. 42-432, Bexar Co., to Wright Electric Co., San Antonio, **$50,000-$100,000.** Bids 9/22. CD 9/15.

†**Texas**—SPRINKLER SYSTEM—U. S. Eng., Albuquerque, N. M., automatic sprinkler sys., to R. E. McKee, 1918 Texas St., El Paso, under **$50,000.**

Tex., Houston—REMOVING STREET CAR RAILS—N. Pickett, mayor, removing street car rails from 42 mi. streets, and replacing concrete pavement, to Brown & Root, Inc., 4300 Calhoun Rd., approx. **$275,000.** Awarded 9/26. CD 6/17—ENR 6/25.

†**Washington**—CLEARING, etc.—U. S. Eng., 810 3 Ave., Seattle, clearing, grading, Grant Co., to L. Romano Eng. Corp., 1300 Dearborn St., Seattle, under **$50,000.**

†**Washington** — COMPASS WORK — U. S. Eng., 810 3 Ave., Seattle, compass work, Spokane Co., to E. L. McCall, Opportunity, under **$50,000.**

†**Washington**—CONSTRUCTION—U. S. Eng., 810 3 Ave., Seattle, concrete construction, Spokane Co., to E. L. McColl, Opportunity, under **$50,000.**

†**Washington**—CONSTRUCTION—U. S. Eng., 810 3 Ave., Seattle, construction, King Co., to A. F. Shepherd, 524 5 Ave. W., Seattle, under **$50,000.**

†**Washington**—UTILITIES—U. S. Eng., 810 3 Ave., Seattle, utilities, steam heating sys., Spokane Co., to Zahniser & Warren, 609 2 St., Spokane, under **$50,000.**

★†**Washington** — RUNWAYS, TAXIWAYS, etc.—U. S. Eng., 810-3 Ave., Seattle, runways, taxiways, hardstandings, Skagit Co., to Parker & Schram, Erickson & Goulter, 515 Couch Bldg., Portland, Ore., **$500,000-$1,000,000.**

Alta., Ensign — AERODROME — Dpt. National Defense for Air, Ottawa, Ont., personnel bldg., mess hall, hangar, etc., Relief Intermediate Aerodrome, to Waterman-Waterbury Mfg. Ltd., 10124 99 St., Edmonton, **$80,000.**

Alta., Stand Off—AIR SCHOOL IMPROVEMENTS—Dpt. Transport, Ottawa, Ont., grading, smoothing, drainage, road gravelling School Relief 2, to Thode Bros., Ltd., Lethbridge, about **$60,000.**

B. C., Fort St. John — AIRPORT — Dpt. Transport, Ottawa, Ont., clearing, burning, stumping, grubbing, stripping, grading, etc., airport, to Tomlinson Constr. Co., Ltd., 1 Somerset Bldg., Winnipeg, Man., about **$93,000.**

★**B. C., Tofino**—AERODROME, CLEARING, etc.—Dpt. Transport, Ottawa, Ont., addnl. clearing, stumping, grubbing smoothing, hardsurfaced runways, taxistrips, etc. aerodrome, to Coast Constr. Co., Ltd., 510 W. Hastings St., Vancouver, about **$710,000.**

Man., Neepawa—AERODROME, GRADING, etc.—Dpt. Transport, Ottawa, Ont., grading, drainage, runway exten. at aerodrome, to Manitoba Eng. Co., Ltd., 204 Lombard Bldg., Winnipeg, about **$35,000.**

N. B., Moncton—AIRPORT—Dpt. Transport, Ottawa, Ont., addnl. airport development, stripping, grading, reconstructing concrete slabs, etc., to Rayner Constr. Co. Ltd., 29 Commercial St., Toronto, Ont., about **$100,000.**

N. S., Halifax — COAST DEFENSE BATTERY—Dpt. Natl. Defense, Ottawa, Ont., coast defense battery, to E. G. M. Cape & Co., Ltd., 620 Cathcart St., Montreal, Que., about **$100,-000.**

N. S., Sydney—AERODROME DEVELOPMENT—Dpt. Transport, Ottawa, Ont., stumping, grubbing, grading, smoothing, drainage, runway, aerodrome, to Standard Paving Maritime Ltd., Capitol Bldg., Halifax, about **$111,-000.**

Ont., Fort William — HANGAR — Canadian Car & Foundry Ltd., 621 Craig St., Montreal, Que., 160x160 ft. timber hangar, concrete fdn., to Barnet McQueen Co., Ltd., P. O. Box 39, Fort William, **$30,000.**

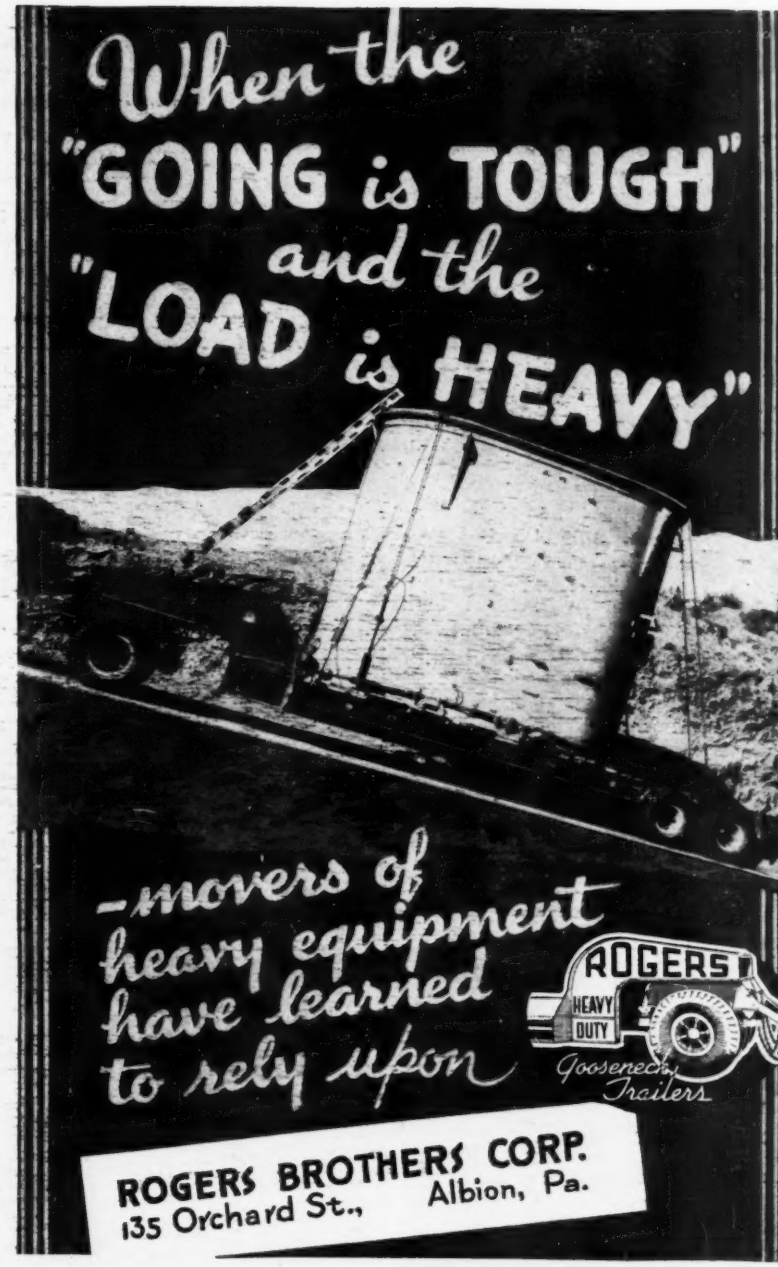
★**Ont., Fort William**—RUNWAYS, etc.—Dpt. Transport, Ottawa, concrete paving 200 ft. wide, 2 main runways 4,700 and 4,100 ft., also paving 3,200 ft. taxi strips, 75 ft. wide, S.F.T. School, to Warren Bituminous Paving Co., Ltd., 437 Fleet St. W., Toronto, about **$600,-000.**

Ont., Jarvis—RUNWAYS, etc.—Dpt. Transport, Ottawa, hardsurfaced runways, taxistrips, No. 1 Bombing and Gunnery School, to Johnson Bros. Co., Ltd., 43 Market St., Brantford, about **$100,000.**

Ont., London — AERODROME IMPROVEMENTS—Dpt. Transport, Ottawa, asphalt taxistrips, taxiway, concrete parking apron, aerodrome, to Towland Constr. Co. Ltd., 294 Dundas St., about **$80,000.** Bids 9/4.

Ont., Long Branch — TRACK — Toronto Transport Comn., 35 Yonge St., Toronto, ½ mi. temporary track exten., own forces. Est. **$35,000.**

Ont., Mohawk—RUNWAY, etc.—Dpt. Transport, Ottawa, draining, aerodrome runway exten., to King Paving Co., Ltd., Box 610 and 6 Line, Oakville, about **$75,000.** Bids 9/4.



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UNCLASSIFIED (Contracts Awarded, Cont'd.)

Ont., Windsor—AIRPORT DEVELOPMENT—Dpt. Transport, Ottawa, addnl. airport development, grubbing, grading, stripping, macadam extens., etc., to Sterling Constr. Co., Ltd., Windsor, about **$146,000.** Est. $161,000. Bids 8/14. CD 8/10.

Que., Dorval—RUNWAY, etc.—Dpt. Transport, Ottawa, Ont., runway, parking area, taxiways and taxistrips, airport, to Dibblee Constr. Co., Ltd., 248 Albert St., Ottawa, Ont., about **$490,000.**

Que., Montreal—RUNWAY—Dominion Govt., Ottawa, Ont., runway for tank testing purposes, to Raymond McDonnell & Co., Ltd., 2020 Union St., **$125,000.** Dpt. National Defense, Ottawa, Ont., engrs.

Que., St. Hubert—HANGAR, etc.—Dpt. National Defense for Air, Ottawa, Ont., hangar, etc., No. 13 E.F.T. School, to L. G. Ogilvie & Co., Ltd., 2228 Walkley Ave., Montreal, about **$120,000.**

Yukon Territory, Teslin Lake—LANDING STRIP, etc.—Dpt. Transport, Ottawa, Ont., landing strip, radio range station, clearing, stumping, grubbing, grading, roads, etc., to British Yukon Navigation Co., Ltd., Vancouver, B. C., about **$168,000.**

Yukon Territory, Watson Lake—AIRPORT DEVELOPMENT—Dpt. Transport, Ottawa, Ont., addnl. airport development, stumping, grading, addn. hardsurfaced runway and taxistrips, rolling, constructing barracks, mess hall, storage, power house, staff quarters, etc., to General Constr. Co., Ltd., Granville Island, Vancouver, B. C., about **$275,000.**

LATIN AMERICA

Mexico—Mexican Govt., Scrita. de Defensa Nacional, Palacio Nacional, Mexico, D. F., plans military city, featuring model barracks, aviation, facilities, homes for officers and families, large hospital, **Tampico, Tamaulipas,** $600,000-$750,000; Territorial Govt. Palacio Territorial Ensenada, B. C., waterworks, drainage and street paving, **Baja California, Mexicali, Tiajuana,** $332,500.

Mexico—Municipal Govt., Palacio Municipal, Mexico, D. F., plans street and road paving, water, drainage and illuminations, in **Mexico City,** $3,150,000; Mexican Govt., Scrita, de la Asistencia Publica, Mexico, D. F., plans public hospitals at **Minatitlan, Coatzacoalcos** and **Tuxpan,** on Gulf of Mexico Coast, Vera Cruz, $525,000; Congressman Estrada, Congreso de la Federation, Mexico, D. F., plans sugar central, **Papaloapan,** Oaxaca, $415,000; Puebla Govt., Palacio del Estado, Puebla, plans sewerage renovation and expansion, public market and slaughterhouse, **Atlixco,** Puebla, $210,000.

PUBLIC BUILDINGS

PROPOSED WORK

★ †**Alabama**—U. S. Eng., U. S. Courthouse & Customhouse, Mobile, bldgs., Pickens Co.

★ †**Arkansas**—U. S. Eng., 300 Bway., Little Rock, bldgs. $1,500,000.

★ †**California** — Richmond Housing Auth., Admin. Bldg., Atchison Village, Richmond, plans by A. F. Roller, Crocker 1st Natl. Bank Bldg., San Francisco, housing units; plans by Carl L. Warnecke, 1700 Financial Center Bldg., Oakland, and R. G. Raney, 233 Post St., San Francisco, housing units, for NHA. CD 9/18—ENR 9/24.

★ †**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., plans by Mylchreest & Reynolds, 238 Palm St., Hartford, demountable housing, Conn. 6121. $1,000,000.

†**Ill., East St. Louis**—East Side Health Dist., c/o Dr. R. C. Garrier, dir., 325 E. Bway., bids soon constructing completing 2 story, bsmnt., health center. $150,000. **FWA.** Johnson, Maack & Saunders, Murphy Bldg., archts. U. S. Pub. Health Service approved project. CD 1/26—ENR 1/29.

★ †**Michigan**—Pub. Housing Auth., NHA, Barlum Tower, Detroit, plans by Mayer & Whittlesey, 744 Buhl Bldg., Detroit, housing; plans by Skidmore, Owings, Merrill & Andrews, 2918 Barlum Tower, Detroit, housing; plans by Stonorov & Kahn, 2609 Barlum Tower, Detroit, housing.

†**Mississippi** — Federal Works Agency, Candler Bldg., Atlanta, Ga., hospital, Miss. 22-148. $115,000.

†**Mo., St. Louis**—Bd. Trustees Washington University, 517 S. Euclid Ave., construction, completion 5 unfinished floors in 14 story, bsmnt. McMillan Hospital. $241,000. **FWA.** Jamieson & Spearl, 1696 Arcade Bldg., archts. CD 9/16—ENR 9/24.

★ †**Mont., Bozeman**—State, election Nov. 3 to vote $690,000 construction at Montana State College, for State Bd. Educ., Helena.

Mont., Havre—State, election Nov. 3 to vote $350,000 for construction at Northwestern Montana College, for State Bd. Educ., Helena. CD 3/4—ENR 3/6.

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

★†**North Carolina**—U. S. Eng., 408 Customhouse, Wilmington, bldgs., Richmond Co. over $5,000,000.

★†**N. C., Chapel Hill**—University of North Carolina, Chapel Hill, new bldgs., imprvs., for Navy. Approx. $1,000,000.

★†**N. C., Wilmington**—C. L. Nichols, city mgr., addn. Walker Memorial hospital. $500,000. **FWA.**

★†**Ohio**—U. S. Eng., Wright Field, Dayton, plans by A. M. Kinney, Enquirer Bldg., Cincinnati, addn. central heating plant and heating tunnel, Montgomery Co. $500,000.

★†**Ohio**—Metropolitan Housing Auth., Lorain, new bids soon housing, for NHA. $850,000. Bids 6/26 rejected. CD 7/9—ENR 7/16, under LB.

★†**Pennsylvania**—Pub. Housing Auth., NHA, 270 Bway., New York, N. Y., plans by E. A. Stopper & S. K. Lichty, Liberty Trust Bldg., Phila., defense housing. $1,500,000. CD 8/3—ENR 8/6.

Pennsylvania—Pub. Housing Auth. NHA., 80 E. Bean St., Washington, housing.

†**Pennsylvania**—Pub. Housing Auth., NHA, 270 Bway., New York, N. Y., bids soon, 100 unit housing, Pa. 36264, Delaware Co. Gleeson & Mulrooney, 1612 Market St., Phila., archts. CD 9/9—ENR 9/17.

†**Pa., Coatesville**—Pub. Housing Auth., NHA, 270 Bway, New York, N. Y., revised plans by Stonorov & Kahn, Bulletin Bldg., Phila., and bids soon 150 unit housing, Pa. 36272 and 100 unit housing, Pa. 36273. CD 8/24—ENR 8/27.

★†**Texas**—U. S. Eng., 231 W. Main St., Denison, bldgs., Tarrant Co. $1,500,000.

★†**Texas**—U. S. Eng., 231 W. Main St., Denison, bldgs. $1,500,000.

†**Texas**—U. S. Eng., 231 W. Main St., Denison, recreation bldgs., facilities. $200,000.

★†**Texas**—U. S. Eng., Fort Sam Houston, bldgs., Bastrop Co. $1,500,000.

†**Tex., Corpus Christi**—A. C. McCaughan, mayor, isolation hospital, Tex. 41-281. $59,999. **FWA.**

★†**Tex., El Paso**—U. S. Eng., Albuquerque, N. M., cancelled bids to have been opened about Sept. 30, bldg. unit. $2,800,000. CD 9/18.

†**Tex., Waco**—Hillcrest Memorial Hospital, Waco, nurses' home, Tex. 41-493. $57,000. Total est. $150,000. **FWA.**

★†**Washington** — Renton Housing Auth., Renton, plans by G. W. Stoddard, Orpheum Bldg., Seattle, addnl. housing units, $4,000,000; plans by I. Palmaw, Railway Exch. Bldg., Seattle, dormitory units, over $1,000,000 both King Co., for NHA.

★†**Washington**—King Co. Housing Auth., County-City Bldg., Seattle, plans by E. W. Morrison & J. T. Jacobsen, Textile Tower, Seattle, housing units, war apartments, dormitories, King Co., for NHA. $4,500,000.

★†**Wash., Seattle**—King Co., County-City Bldg., plans by G. W. Stoddard, Orpheum Bldg., hospital addn. $800,000. **FWA.**

★†**Wash., Vancouver** — Bonneville Auth., P. O. Box 3527, Portland, Ore., substation expansion, new transformer banks, condensers, exten. 115,000 and 230,000 volt buses and new steel tower line. $1,300,000.

†**Wash., Vancouver**—Clark General Hospital, 3409 Main St., plans by D. J. Stewart & Associates, 707½ Main St., hospital addns. $319,370. **FWA.** CD 8/12—ENR 8/20.

†**Wash., Vancouver** — Vancouver Housing Auth., plans by D. W. Hilborn, Central Bldg., high and 2 schools, McLoughlin Heights, for NHA. $378,000

†**Wisconsin**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, Ill., plans by Bogner, Darby & Law & Potter, 759 N. Milwaukee St., Milwaukee, housing, incl. stores, school and administration bldg., Sauk Co.

Alta., Edmonton—Municipality, power plant addn. $369,000.

★**Ont., Ottawa**—Wartime Housing, Ltd., 55 York St., Toronto, bids soon 300 permanent houses. $1,200,000. CD 8/19—ENR 8/27.

BIDS ASKED

Bids Asked October 12

†**Missouri**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., bldg.

★†**N. Y., Buffalo**—Pub. Housing Auth., NHA, 270 Bway., New York, 300 unit permanent housing, N.Y. 2-4. F. C. Backus, 360 Delaware Ave., archt.

Bids Asked October 13

★†**N. Y., Massena**—Pub. Housing Auth., NHA, 270 Bway., New York, 200 unit permanent housing, N.Y. 30083. Mayer-Whittlesey, 31 Union Sq., New York, archts.

Bids Asked October 14

†**N. Y., Lackawanna**—Our Lady of Victory Hospital, altering hospital to provide training school for nurses. **FWA.** M. J. Murphy, 202 Curtiss Bldg., Buffalo, archt.

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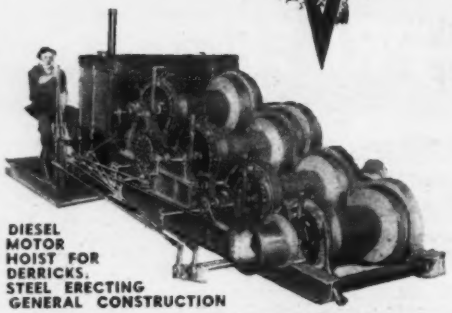

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PUBLIC BLDGS. (Bids Asked, Cont'd.)

Bids Asked October 14

†**Me., York**—Town, 1 story, frame school Me 17-117. $55,000 **FWA.** Extended date. Huddleston Hersey, Dover Rd., Durham, N. H., archts. Plans deposit $15. CD 9/8—ENR 9/3.

Bids Asked October 15

†**California**—Bureau Reclamation, S. O. Harper, ch. engr., Denver, Colo., furnishing, del. 270 ton transformer-transfer car for Keswick power plant, Kennett Div., Central Valley Project, Spec. 1669-D.

Ont., Ottawa—Secretary Dpt. P. Wks., Ottawa, hostel for Civil Service Junior Women employees, Sussex and St. Patrick Sts. $350,000-$400,000.

Bids Asked October 16

†**Tex., Brownwood**—Pub. Bldgs. Admr., North Interior Bldg., Wash., D. C., health center, No. 41-209.

Bids Asked October 20

†**California**—Bureau Reclamation, Denver, Colo., four 30-in. sphere valves, with controls, metalwork, for station-service penstocks, Shasta Power Plant, Kennett Div., Central Valley Project, Spec. 1049. J. C. Page, comr.

Bids Asked

†**Connecticut**—Bristol Housing Auth., City Hall, Bristol, community bldg., utilities, playgrounds, etc., Peck Lane, Conn. 6092, for NHA. $150,000. Plans deposit $50 first set, $10 each other set. H. A. Hayden, 175 Main St., Bristol, and R. J. Percival, 12 Haynes St., Hartford, archts.

★†**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., dwelling units, duplex houses, Conn. 6017. $500,000. Cudworth & Thompson, 257 Main St., Norwich, archts. Henri Van Zelm, 11 Asylum St., Hartford, engr. CD 7/6—ENR 7/9.

†**Massachusetts**—U. S. Eng., Park Sq., Bldg., Boston, (selected list bidders) housing. No 699-43-79, Middlesex Co.

†**Massachusetts**—U. S. Eng., Park Sq. Bldg., Boston, Mass., (selected bidders) temporary bldgs., No. 175-43-neg. 86.

†**Massachusetts**—U. S. Eng., Park Sq. Bldg., Boston (from selected bidders), altering bldgs., Inv. 175-43-NEG 91, Middlesex Co. Under $50,000.

★†**New Mexico**—U. S. Eng., Albuquerque, frame temporary bldgs., Otero Co. $1,000,000. Plans deposit $100.

†**Oklahoma** — U. S. Eng., Fort Sill, frame bldgs., facilities. $250,000. Plans deposit $50.

†**Oklahoma**—U. S. Eng., Fort Sill, cold storage bldg., facilities, Comanche Co. $100,000 Plans deposit $50.

†**Rhode Island**—U. S. Eng., 819 Industrial Trust Bldg., Providence, (selected list bidders) shop, No. 699-43-78, Newport Co.

†**Rhode Island**—U. S. Eng., 819 Industrial Trust Bldg., Providence (selected bidders), bldg., Inv. 699-43-69, Newport Co.

†**Texas**—U. S. Eng., 25 St. and Avenue F, Galveston, 1 and 2 story frame bldgs. Over $150,000. Plans deposit $50.

†**Texas**—U. S. Eng., Fort Sam Houston, utilities bldgs., utilities, surfaced areas, etc., Spec. 42-350. Plans deposit $25.

LOW BIDDERS

†**California**—U. S. Eng., 1209 8 St., Sacramento, Sept. 28, bldgs., Spec. 224, Sacramento Co., from G. W. Williams Co., 10 California Dr., Burlingame, **$100,000-$500,000.**

†**Calif., Bellflower**—Federal Works Agency, 1206 Santee St., Los Angeles, Oct. 2, school, Calif 4-178, Units 1, 2, 3 and 4, from C. W. Driver, 111 W. 7 St., Los Angeles, **$162,000.** Kistner & Wright, Architects Bldg., Los Angeles, archts. CD 3/24—ENR 3/24.

†**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., Sept. 24, community bldg., water, sewer utilities, grading, landscaping for housing, Project 6037, from Bedford Hills Constr. Corp., Bedford Hills, N. Y., **$80,900.** Henry Van Zelm, 11 Asylum St., Hartford, engr. CD 9/21.

†**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., Sept. 30, war dormitories, community bldg., utilities, etc., Conn. 6141, 6012 and 6015, from Agostini Bros. Building Corp., 55 W. 42 St., New York, N. Y., **$253,541.** CD 9/24—ENR 10/1.

†**Mississippi**—U. S. Eng., foot of Prytania St., New Orleans, La., Sept. 28, bldgs., from R. J. Jones, 318 Main St., Pineville.

†**Nevada**—U. S. Eng., 4792 Sepulveda Blvd., San Bernadino, Calif., Sept. 29, bldgs., Inv. 247, Clark Co., from O. J. Scherer, P. O. Box 178, Angels Camp. CD 9/24.

PUBLIC PLDGS. (Low Bidders, Cont'd.)

★†**Oklahoma**—U. S. Eng., 416 Wright Bldg., Tulsa, bldgs., grading, all underground utilities except electrical distr. sys., from A & B Constr. Co., Box 111, Wichita, Kan., **$1,000,000-$5,000,000.** CD 9/2—ENR 9/10.

★†**Pennsylvania**—Allegheny County Housing Auth., 201 County Office Bldg., Pittsburgh, Sept. 25, housing, community bldg., sewer facilities, etc., for NHA, from Caristo Constr. Corp., 26 Court St., Brooklyn, N. Y., **$1,865,000.** CD 9/23—ENR 8/27.

★†**Texas**—U. S. Eng., Fort Sam Houston, about Sept. 21, bldgs., Spec. 42-408, Taylor Co., from L. L. McCandless, 1809 Riverview St., Austin, **$500,000-$1,000,000.** CD 9/14—ENR 9/10.

†**Texas**—U. S. Eng., Fort Sam Houston, bldgs., Solic. 257-43-66, from Loftis & Hudson, 3105 Mockingbird Lane, Dallas, **$100,000-$500,000.** CD 8/19—ENR 8/27.

†**Texas**—U. S. Eng., Fort Sam Houston, military project, from Quisle & Andrews, 601 Builders Exch. Bldg., San Antonio, **$100,000-$500,000.**

†**Texas**—Pub. Housing Auth., NHA, c/o M. Amis, reg. dir., Electric Bldg., Fort Worth, Sept. 29, permanent housing, Tex. 4113, from W. O'Connell, Whitmore Hotel, Dallas. CD 9/17—ENR 9/24.

†**Texas**—U. S. Eng., 25 St. and Avenue F, Galveston, bldgs., Galveston Co., from A. L. Hays, 419 6 St., Port Arthur.

★†**Va., Norfolk**—At office Federal Works Agency, 606 State Planters Bank Bldg., Richmond, Sept. 30, hospital bldg. at St. Vincent De Paul Hospital, from M. Millimet & Assoc., Inc., 446 Oak Grove Rd., Talbot Park, Norfolk. **$1,254,000.** CD 9/23—ENR 10/1.

†**Alaska, Sitka**—Federal Works Agency, Alaska Bldg., Seattle, Wash., Sept. 30, rein.-con. hospital, Docket 50-106, from Beckett & Bridges, 420 Bd. Trade Bldg., Portland, Ore., **$189,725.** Est. $140,000. **FWA.** CD 9/15—ENR 9/17.

CONTRACTS AWARDED

†**Alabama**—U. S. Eng., Bynum, warehouses and miscellaneous bldgs., Calhoun Co., to Perusini Constr. Co., Martin Bldg., Birmingham, Marbury-Borias Constr. Co., Massey Bldg., Birmingham and Andrew & Dawson Constr. Co., Montgomery, **$100,000-$500,000.** Bids 9/25. CD 9/10.

†**Alabama**—U. S. Eng., Gadsden, building group, Etowah Co., to A. Blair, 1st Natl. Bk. Bldg., Montgomery.

★†**Alabama**—U. S. Eng., Talladega, temporary frame bldgs., Talladega Co., to Marbury-Borias Constr. Co., Massey Bldg., Birmingham. Est. **$500,000.** Bids 9/26. R. L. Kenan & Associates, Bell Bldg., Montgomery, engrs. and archts.

†**Alabama**—U. S. Eng., U. S. Courthouse & Customhouse, Mobile, addnl. housing, Mobile Co., to Foster & Creighton Co., American Natl. Bank Bldg., Nashville, Tenn.

†**Ark., Norfolk**—U. S. Eng., Gay Bldg., Little Rock, 3 kva. transformers, at Norfolk Dam power plant, to Moloney Electric Co., 5390 Bircher St., St. Louis, Mo. CD 9/16. Bids 9/22.

★†**California**—Industrial Company, housing units, Contra Costa Co., to Robert McCarthy Co., 1050 Kirkham St., San Francisco, to Louis C. Dunn, Inc., 799 Monadnock Bldg., San Francisco, and to O. M. Rousseau, 321 Kearny St., San Francisco. Total **$13,000,000.** U. S. Maritime Comn. will finance. CD 9/23—ENR 10/1.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, Calif., telephone headquarters, to J. B. Allen, 1012 Elm St., San Carlos. Awarded 9/21.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, remodeling bldg., to Carl J. Fung & Co., 700 Sacramento St., San Francisco. Awarded 9/22.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, Classification Shed 124 and Transit Shed 125, Alameda Co., to Cahill Bros., 206 Sansome St., San Francisco, and B. C. Gerwick, Inc., 122 Market St., San Francisco. Awarded 9/24.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, converting motor pool bldg. into offices, San Francisco Co., to O. C. Moroney, 1437 Drake Ave., Burlingame. Awarded 9/25.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, theatre of operations housing, to Whalin Bros., 2942 23 Ave., Oakland. Awarded 9/25.

†**California**—U. S. Eng., 74 Montgomery St., San Francisco, bldg., Monterey Co., to Pacific Builders, 312 E. Alisal St., Salinas. Awarded 10/2.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, Calif., converting motor pool bldg. to office, to O. C. Moroney, 1437 Drake Ave., Burlingame; electrical work, to G. H. Armstrong Electric Co., Inc., 1388 Van Ness Ave., San Francisco.

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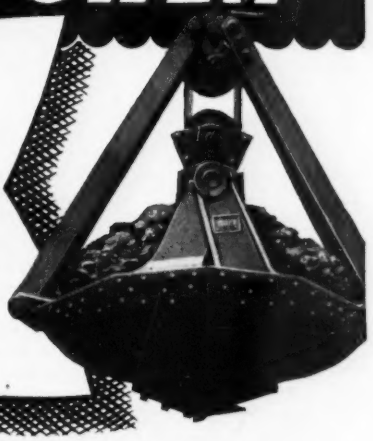

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PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

†**California**—Natl. Advisory Com. for Aeronautics, Ames Aeronautical Laboratory, Moffett Field, Sunnyvale, bldg., to W. P. Goodenough, 49 Wells Ave., Palo Alto. Est. **$220,000.** Awarded 10/1.

★ †**Calif., Port Chicago**—Yards & Docks, Navy Dpt., Wash., D. C., consttruction addnl. Naval facilities, Supplementary Contr., 1, NOY 5267, to Duncanson-Harrelson Co., 1404 DeYoung Bldg., San Francisco, **$1,641,500.** Additional to CD 2/5—ENR 3/12, under unclassified, CA.

★ †**Colorado**—U. S. Eng., Denver, Colo., bldgs., to Peter Kiewit Sons Co., 1024 Omaha Natl. Bank Bldg., Omaha, Neb., **$1,000,000-$5,000,000.**

†**Delaware**—U. S. Eng., 6 and Walnut Sts., Phila., Pa., boiler house and heating room, New Castle Co., to Rupert Constr. Co., 1509 French St., Wilmington, under **$50,000.**

†**Florida**—U. S. Eng., Court House, Jacksonville, hospital, Inv. Neg. Jax. 43-253, Orange Co., to Palmer Eng. & Constr. Co., Cassett Ave., Jacksonville. Est. under **$500,000.** Awarded 9/23.

†**Georgia**—U. S. Eng., 494 Spring St. N.W., Atlanta, hospital addns., Fulton Co., to Gilbert Beers, Red Rock Bldg., Atlanta.

★ †**Georgia**—U. S. Eng., 494 Spring St. N.W., Atlanta, bldgs., Richmond Co., to J. B. McCrary Constr. Co., 22 Marietta St. Bldg., Atlanta, **$500,000-$1,000,000;** grading roads, and parking areas, Richmond Co., to R. A. Bownen and W. S. Kogers, Macon.

†**Illinois**—U. S. Eng., Court House, St. Louis, Mo., bldgs., St. Clair Co. to J. E. Anderson & Son Constr. Co., P. O. Box 7, Rantoul, est. **$100,000-$500,000;** railroad spur track, underdrain, timber crossing, concrete culvert, St. Clair Co., to D. C. Bowman, 51 Bremen St., St. Louis, Mo., est. under **$50,000.**

†**Louisiana**—U. S. Eng., foot of Prytania St., New Orleans, civilian mess and utilities, Inv. 43-98, to Rabalais & Murphy, Baton Rouge, Awarded 9/29.

†**Louisiana**—U. S. Eng., foot of Prytania St., New Orleans, to E. E. Rabalais & Son, Bunkie. Awarded 9/28.

†**Maine**—U. S. Eng., Park Sq. Bldg., Boston, Mass., frame temporary bldgs., 175-43-NEG 90, Aroostook Co., to T. W. Cunningham, Inc., 61 State St., Bangor. Est. **$100,000-$500,000.** CD 9/29—ENR 10/1.

★ †**Maine**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., dormitory apartments, Me. 17038, to Skolnik Building Corp., 17 E. 42 St., New York, N. Y., **$1,339,900.** Bids 9/25. CD 9/30, under LB—ENR 9/17, under BA.

†**Md., Baltimore**—West Baltimore General Hospital, Inc., Rayner and Dukeland Aves., hospital addn., to John K. Ruff Co., 100 W. 22 St., **$415,103. FWA.** CD 8/4—ENR 8/6.

†**Massachusetts** and **Connecticut**—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., prefabricated bldgs., Bristol Co., Mass., and Hartford and New Haven Counties, Conn., Inv. 699-43-68, to Travelodge Corp., 1120 Madison St., Lynchburg, Va. Est. **$100,000-$500,000.** Bids 9/25.

★ †**Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, civilian housing units, to M. A. Clausen, 15529 Woodrow Wilson St., Detroit, less than **$1,000,000.**

★ †**Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, erection prefabricated bldgs., constructing theatre of operations type bldgs., etc., Macomb Co., to B. W. Handler Constr. Co., 12 E. 13 St., Chicago, Ill., under **$1,000,000.**

★ †**Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, mobilization bldgs., Macomb Co., to B. Chemers Co., 111 W. Washington St., Chicago, Ill., under **$1,000,000;** target butts and temporary bldgs., Macomb Co., to Atkin-Fordon Co., 7360 W. Chicago St., Detroit, under **$1,000,000.**

★ †**Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, altering warehouse, Wayne Co., to Pom-McFate Co., 5222 St. Jean Ave., Detroit, less than **$1,000,000.**

†**Mississippi**—U. S. Eng., U. S. Courthouse & Customhouse, Mobile, Ala., housing, to Perry Flint Constr. Co., Hattiesburg, under **$175,000.**

†**Missouri**—U. S. Eng., 1709 Jackson St., Omaha, Neb., frame bldgs., Clark Co. to General Constr. Co. and J. W. Johnson, 5205 Hollywood Blvd., Los Angeles, Calif. Est. under **$500,000.**

★ †**Nebraska**—U. S. Eng., 10 E. 17 St., Kansas City, Mo., frame bldgs., grading work, Adams Co., to Peter Kiewit Sons Co., 1024 Omaha Natl. Bank Bldg., Omaha, and George W. Condon Co., 208 Grain Exchange, Omaha, **$1,000,000-$5,000,000.**

†**New Jersey**—Defense Plant Corp., 811 Vermont Ave. N.W., Wash., D. C., bldg., plant alterations, etc., Middlesex Co., to H. K. Ferguson, 1650 Hanna Bldg., Cleveland, O., over **$150,000.**

†**New Jersey**—Industrial Company, plant, Essex Co., to Mahony-Troast Const. Co., 657 Main St., Passaic **$65,000;** electrical work, to Watson-Flagg Eng. Co., 24 North St., Paterson. Federally financed. Albert Kahn Associate Archts. & Engrs., 345 New Center Bldg., Detroit, Mich., archts. and engrs.

†**New Jersey**—U. S. Eng., 6 and Walnut Sts., Phila., Pa., military housing, Cape May Co., to Rupert Constr. Co., 1509 French St., Wilmington, Del., **$100,000-$500,000.**

†**New Jersey**—U. S. Eng., 6 and Walnut Sts., Phila., Pa., addnl. facilities, Salem Co., to J. P. Donovan, 770 S. Schuylkill Ave., Phila., Pa., **$100,000-$500,000.**

†**New Jersey**—U. S. Eng., 6 and Walnut Sts., Phila., Pa., temporary frame bldgs., Monmouth Co., to Wison Bros. Building, Inc., North Plainfield, **$50,000-$100,000.**

★ †**New Mexico**—U. S. Eng., Albuquerque, addnl. temporary bldgs., Curry Co., to G. Mora, 312 Sabine St., Houston, Tex., **$1,000,000-$5,000,000.**

†**New Mexico**—U. S. Eng., Albuquerque, bldg., McKinley Co., to E. S. McKittrick, Inc., Carlsbad, under **$500,000.** Awarded 9/29.

†**New York**—Defense Plant Corp., 811 Vermont Ave. N.W., Wash., D. C., factory, to John T. Woodruff & Son, Grand Central Terminal, New York. Est. **$65,000.** Long Island Optical Co., Inc., 36-32 34 St., Long Island City, lessee. Wuest & Bailey, 32-02 36 Ave., Long Island City, archts.

★ †**New York**—U. S. Eng., 120 Wall St., New York, construction-management for military installation, Rockland Co., to Cauldwell-Wingate Co., 101 Park Ave., New York, and Poirier & McLane Corp., 33 W. 42 St., New York, over **$5,000,000.** Engineer-architect services by Tuttle, Seelye, Place & Raymond, 101 Park Ave., New York.

†**North Carolina**—U. S. Eng., Charlotte, miscellaneous bldgs., Union Co., to Goode Constr. Corp., Builders Bldg., and Southeastern Const. Co., 218 W. 2 St., both Charlotte. Bids 9/26.

†**North Carolina**—U. S. Eng., Charlotte, bldgs., Mecklenburg Co., to P. S. West Constr. Co., Statesville. Bids 9/25.

★ †**Ohio**—U. S. Eng., 700 Union Guardian Bldg., Detroit, Mich., theatre of operation bldgs., to Steinle-Wolfe Inc., 1515 Croghan St., Fremont, under **$1,000,000.**

★ †**Ohio**—U. S. Eng., 700 Union Guardian Bldg., Detroit, Mich., administration bldg., to Schirmer Peterson Co., 6830 Beaver Ave., Cleveland, under **$1,000,000.**

★ †**Tennessee**—U. S. Eng., P. O. Box 97, Memphis, bldgs., Lauderdale Co., to A. Farnell Blair, Decatur, Ga., under **$3,000,000.**

★ †**Texas**—U. S. Eng., 231 W. Main St., Denison, military housing, to Loftis & Hudson, 3105 Mockingbird Lane, and H. L. Hill & Co., 4353 Lovers Lane, both Dallas, **$500,000-$1,000,000;** roads, streets and area drainage, to Kerr Cook & Thannisch, Fort Worth, **$100,000-$500,000.** Awarded 9/30.

★ †**Texas**—U. S. Eng., 231 W. Main St., Denison, bldgs., Sol. 257-43-74, from Randall Constr. Co., Amarillo, and J. L. Foxworth, 4403 De Loache Ave., Dallas, **$1,000,000-$5,000,000.**

†**Texas**—U. S. Eng., Fort Sam Houston, bldgs., paving, underground utilities, Spec. 42-363, Bexar Co., to Jim Handley, Inc., 720 Travis Bldg., San Antonio, **$50,000-$100,000.** CD 9/9.

†**Texas**—U. S. Eng., Fort Sam Houston, addnl. bldgs., Medina Co., to H. B. Zachry, Builders Exchange, San Antonio, **$100,000-$500,000.**

†**Texas**—U. S. Eng., Fort Sam Houston, military project, Brown Co., to C. H. Oehler, 3007 Bway., Galveston, under **$500,000.**

†**Texas**—U. S. Eng., Fort Sam Houston, bldgs., to W. L. Wyman & Son, 1038 Hendricks St., Dallas, under **$50,000.** CD 9/16.

†**Texas**—U. S. Eng., Fort Sam Houston, bldg., Spec. 42-269, Bexar Co., to V. and A. Falbo, 515 N. San Saba St., San Antonio, under **$50,000.**

†**Texas**—U. S. Eng., Fort Sam Houston, warehouse, Spec. 42-379, Bexar Co., to Hawley-Riley, Inc., Builders Exch. Bldg., San Antonio, under **$50,000.** CD 9/17, under BA.

†**Texas**—U. S. Eng., Fort Sam Houston, bldgs., Spec. 42-353 (in part), to Taylor & Byrne, 605 1st Natl. Bank Bldg., Fort Worth, **$100,000-$500,000.** Awarded 9/26.

†**Texas**—U. S. Eng., Fort Sam Houston, warehouse, fire station, sewer, water, gas lines, electric service, etc., Spec. 42-439, Medina Co., to Baugh & Scott, 562 Donaldson St., San Antonio, under **$50,000.** CD 9/23. CD 9/18.

†**Texas**—U. S. Eng., Fort Sam Houston, bldgs., Spec. 42-353, in part, to H. J. Von Rosenberg, Builders Exch. Bldg., San Antonio, **$100,000-$500,000.** Bids about 9/21, awarded 9/23. CD 9/14.

★ †**Texas**—U. S. Eng., 25 St. and Avenue F, Galveston, general contral bldgs., utilities, Galveston Co., to A. L. Hays, 419 6 St., Port Arthur, **$500,000-$1,000,000.** CD 7/6—ENR 7/9, under LB.

†**Utah**—U. S. Eng., 32 Exchange Pl., Salt Lake City, bldgs., to James I. Barnes Constr. Co., Hill Field, Ogden, under **$250,000.**

PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

★†**Washington**—Bremerton Housing Auth., Bremerton, housing Proj. FPHA-45-141, for NHA; to Lease & Leigland, Dexter Horton Bldg., Seattle, **$747,500.** F. A. Naramore & Associates, Smith Tower, Seattle, archts. CD 9/30, under LB.

★†**Washington**—U. S. Eng., 310 3 Ave., Seattle, bldgs., Grant Co., to Woodworth & Co., Inc., and Macdonald Building Co., 1517 S. Tacoma Way, Tacoma, **$1,000,000-$5,000,000.**

†**Washington**—U. S. Eng., 310 3 Ave., Seattle, storage facilities, Spokane Co., to E. L. McCall. Opportunity, under **$50,000.**

★**Alta., Wainwright**—Dpt. Natl. Defense, Ottawa, Ont., Brigade Headquarters, barracks, mess and store halls, officers' and N.C.O.'s quarters, etc., to Bennett & White Constr. Co., Ltd., 302 Examiner Bldg., Calgary, about **$1,000,000.** CD 5/21—ENR 6/4.

B. C., Vancouver—Dpt. Natl. Defense, Ottawa, Ont., 250 prefabricated huts, to Prefabricated Buildings, Ltd., foot of Byrne St., **$262,000.**

Man., Rivers—Dpt. National Defense for Air, Ottawa, Ont., addnl. temporary accommodation, at mess halls, barracks, etc., Air Navigation School 1, to Claydon Co., Ltd., 290 Garry St., Winnipeg, about **$200,000.**

★**N. B., Utopia (Lake)**—Dpt. National Defense, Ottawa, Ont., barracks, mess halls, officers quarters, etc., 35 bldgs. in all, to R. A. Corbett & Co., Ltd., 61 Canterbury St., St. John, **$556,000.** CD 8/13.

★**N. S., Halifax**—Wartime Housing Ltd., 55 York St., Toronto, Ont., 225 addnl. houses, to Brookfield Constr. Co., Ltd., 169 Hollis St., about **$500,000.**

★**N. S., Windsor**—Dpt. National Defense, Ottawa, Ont., barracks, mess halls, recreation bldg., officers mess, etc., admin. bldg., to Fundy Constr. Co., Ltd., Russell and Islesville St., Halifax, about **$1,000,000.**

★**Ont., Brockville**—Dpt. National Defense, Ottawa, barracks, quarters, mess halls, Officers' Training School, to Fried Constr. Co., Ltd., 70 Victoria St., Toronto, about **$750,000.**

Ont., London—Central Aircraft, Ltd., London, fabric shop addn., cafeteria, large hangar, reservoir, etc., for Dpt. Munitions & Supply, Ottawa, to Frontenac Constr. Co., Ltd., 704 C. P. R. Bldg., Toronto, about **$375,000.** CD 9/15—ENR 9/17, under Industrial Bldgs.

Ont., Orilla—Wartime Housing, Ltd., 55 York St., Toronto, 75 houses, to Dickie Constr. Co., Ltd., 17 Yorkville Ave., Toronto, about **$165,000.**

Ont., Ottawa—Natl. Research Council of Canada, Sussex St., bldg. addns., Montreal Rd., to Doran Constr. Co., Ltd., 78 Bank St., **$275,000.** C. D. Sutherland, Dpt. P. Wks., archt.

★**Ont., Ottawa**—Dpt. National Defense, Ottawa, 2 story, bsmnt. frame temporary office, Cartier Sq., to Redfern Constr. Co., Ltd., Excelsior Life Bldg., Toronto, about **$500,000.** Awarded 9/28. CD 9/30.

Que., Beauharnois—Wartime Housing, Ltd., 55 York St., Toronto, Ont., 100 single family dwellings, to G. Archambault, Ltd., 726 Atwater St., Montreal. Est. **$325,000.** Bids 9/15.

Que., Montreal—Dominion Govt., Ottawa, Ont., storage bldgs., to Kennedy Constr. Co., Ltd., 407 McGill St. Est. **$300,000.** Dpt. Munitions & Supply, Ottawa, Ont., engrs. CD 2/5—ENR 2/12.

Que., Rock Island—Wartime Housing, Ltd., 55 York St., Toronto, Ont., 50 single family dwellings, day labor. **$150,000.**

Que., Montreal—Dpt. Natl. Defense, Ottawa, Ont., 2 storage and 5 camp bldgs., No. 4 Military Depot, to Douglas Bremner Constr. Co., Ltd., 2049 McGill St., about **$100,000.**

Que., Ste. Anne de Bellevue (Montreal)—Secretary Dpt. Munitions & Supply, Ottawa, addnl. accommodations, frame barracks, mess hall, etc., at C.W.A.C. Training depot, MacDonald College, to Frank Ross Constr. Co., Ltd., 5540 Woodbury Ave., Montreal, about **$200,000.** Bids 8/25. CD 8/20, under Unclassified.

Que., St. Hyacinthe—Municipality, technical school, Laframboise St., to Dansereau, Ltd., 1587 Benard Ave. W., Montreal, about **$200,000.** CD 6/9.

Que., Valcartier—Dpt. Natl. Defense, Ottawa, Ont., barracks, mess halls, etc., Military Camp, to Page Equipment & Constr. Co., Ltd., 1497 Craig St., Three Rivers, about **$400,000.** CD 9/10—ENR 9/17.

Sask., Dafoe—Dpt. National Defense for Air, Ottawa, Ont., barrack blocks, mess halls, officer quarters, recreation bldg., etc., to Bird Constr. Co., Ltd., 7 and Smith Sts., Regina, about **$200,000.**

★**Yukon Territory, Whitehorse**—Dpt. Transport, Ottawa, Ont., operations bldgs. for R.C.A.F. Home War Establishment, to Bennett & White Constr. Co., Ltd., 510 W. Hastings St., Vancouver, B. C., about **$1,000,000** cost plus fixed fee.

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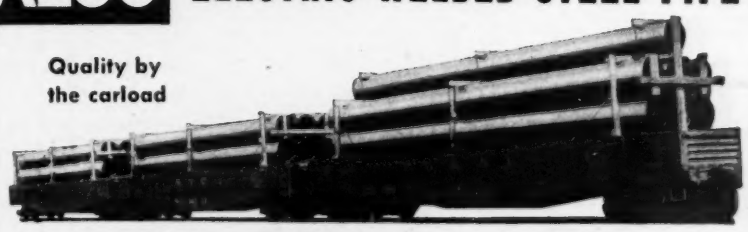

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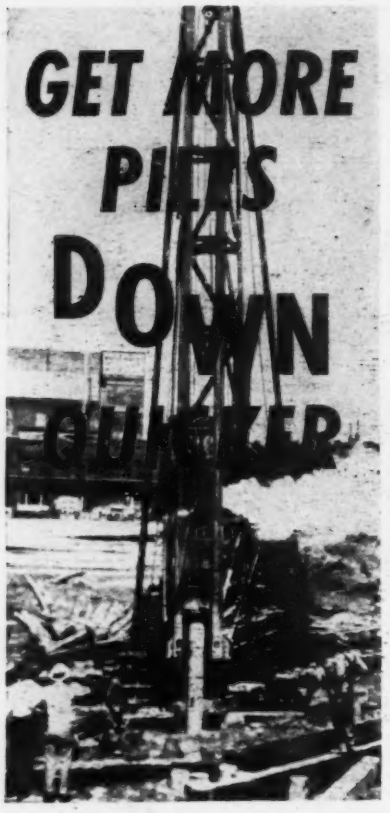

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COMMERCIAL BUILDINGS

PROPOSED WORK

Calif., Hayward—Cox Building Co., 25188 Nile Rd., plans by Gilbert Hodgson, 1026 El Camino Real, San Carlos, ninety-four 1 story frame residences, Hayward Heights. $376,000.

Calif., Hayward — Associated California Builders Corp., 941 Atherton St., fifty-four 1 story frame residences, B St. between 7 St. and Arlette Ave. $216,000.

★ **Calif., Manteca**—Morehouse, Merrell & Smith, c/o Pen Realty Co., 1464 Burlingame Ave., Burlingame, two hundred fifty 1 story frame residences, northeast section. $1,000,000.

Conn., Bridgeport—Owner, c/o P. P. Petrofsky, archt., 177 State St., 3 story, brick, concrete, steel apartment. $150,000.

Kan., Lawrence—W. H. Shackelford, 7510 Ward Parkway, Kansas City, Mo., plans by Nevill & Sharp, Midland Bldg., Kansas City, Mo., 56 unit frame housing. $200,000. CD 9/21—ENR 10/1.

Miss., Greenwood—Greenwood Homes, Inc., Greenwood, 60 houses. $220,000.

N. J., Belmar—Runyon Park, Inc., Lehman Ave., Deal, 3 U shaped, concrete, brick apartments.

N. J., Perth Amboy—Roosevelt Park, Inc., 2 St. and Lafayette Ave., Raritan, forty-one 2 story, bsmnt. residences. $358,250.

O., Cleveland—Fenwick Constr. Co., J. Markowitz, 2405 De Sota St., 45 houses. $270,000.

★ **O., Piqua**—L. Jungclas, 161 Linden Ave., Wyoming, sixty 4 family apartments. Miami Co. Total est. $600,000.

O., Warren—Warren Homes, Inc., c/o P. N. Fithian & M. N. Goodwin, Union Natl. Bank Bldg., Youngstown, 42 homes. $250,000.

CONTRACTS AWARDED

★ **Calif., Benicia**—Bay Counties Homes Co., Benicia, one hundred fifty 1 story frame residences, Highlands Tract, to Niels Schultz Constr. Co., 1 Hillcrest Blvd., Millbrae Highland. Est. **$600,000.**

Calif., Hayward—Carl C. Lassen, 123 Palm Dr., Piedmont fifty-three 1 story frame residences, Westfield Tract. Owner builds. **$212,000.**

Calif., Larkspur—Varsi, Inc., Box 102, 43 residences, Heather Gardens, etc. Owner builds. **$172,000.**

★ **Calif., Richmond**—J. H. Crawford, 1344 Woodland Ave., San Carlos, two hundred 1 story frame residences. Owner builds. **$800,000.** W. G. Frost, 58 Turnsworth St., Redwood City, engr.

★ **Calif., San Bernardino**—Western Defense Housing Corp., 1041 E. Green St., Pasadena, one hundred ninety-eight 5 room dwellings. Owner builds. Electrical work, to Mactolf-Doll Electric Co., 1023 S. Brand Blvd., Glendale. Est. **$600,000.** CD 7/20—ENR 7/23.

Calif., San Leandro—H. K. Jensen, 3294 Morcom Ave., 1 story residences. Owner builds. Electrical work, to Clifford Electrical Co., 820 E. 14 St., Oakland. I. M. Johnson, 449 Moss Ave., Oakland, archt.

Conn., Fairfield—Citizens Homes, Inc., 248 Greenwich Ave., 6 room frame homes, to Jander & Forgione, Inc., 248 Greenwich Ave., Greenwich. Est. over **$150,000.**

Conn., Milford—Devonshire Estates, Stowe Property, Walnut Beach, 48 frame residences. Owner builds. **$168,000.** Est. $150,000.

Conn., Stratford—Highland Building Corp., Highland Ave., twenty-eight 1 story, 48x48 ft. frame homes, Wainwright Ave., to John P. Rowena, 443 Church Hill Rd., Fairfield. Est. **$154,000.** A. L. Craft, Waldo Ave. and W. 244 St., New York, N. Y., archt.

Conn., Waterbury—M. Sealander, 1 West St., Newtown, thirty-nine 2½ story, 25x32 ft. homes, Hill St. Owner builds. **$250,000.** H. Koerner, 83 Fairfield Ave., Bridgeport, archt.

★ **Me., South Portland (br. Portland)**—Sunset Park & Development Co., Lebanon St., Sanford, 200 frame houses, owner builds; electrical work, to Geo. H. Sears, 244 Brackett St., Portland. Est. **$800,000.**

Nev., Las Vegas—E. Allen, 104 S. 3 St., 72 frame, stucco residences, north Fremont St. between 15 and 17 Sts., to Forest Schidler, 324 Fremont St. Est. **$300,000.** C. Chas. Lee, 1648 Wilshire Blvd., Los Angeles, archt.

O., Akron—Heminger-Ritzman Co., 1099 S. Main St., seventy-five 4 room homes, Nester St. near 27 St. Owner builds. **$200,000.**

O., Akron—Heslop Building & Realty Co., Tower Bldg., forty-three 4 room homes, Goodyear Heights and Eastland Subdivisions. Owner builds. Est. **$175,000.** Awarded 9/28.

O., Akron—Victory Homes, Inc., C. R. Miller, vice pres., Akron, 82 bungalows, Firestone Blvd., Wilbeth Rd. and Hammel St. Owner builds. **$250,000.**

O., Columbus—Washburn-McKinley Homes, Inc., 192 W. Kenworth Rd., 50 residences, 24 Ave., separate contracts. Est. **$250,000.** CD 4/24—ENR 4/30.

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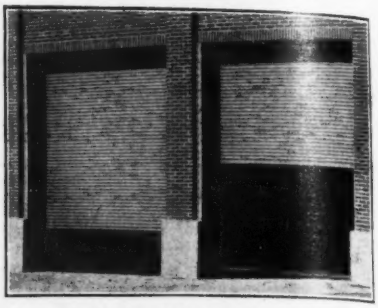

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COMMERCIAL BLDGS. (Contracts Awarded, Cont'd.)

★**O., Dayton**—Castlewood Development Co., C. B. Burch, in charge, 600 Fountain Sq. Bldg., Cincinnati, one hundred sixty 1 story residences, Castlewood plot north Dayton city limits, to Lang Bros., 7601 Reading Rd., Cincinnati. Total est. **$650,000.**

★**Pennsylvania**—Tyson Constr. Co., Garrett Rd. and Chestnut St., Upper Darby, 132 single homes, Lynnewood Dr., Fairmount Rd., Melrose and Maryland Aves., Haverford Twp., Delaware Co. Owner builds. Est. over **$700,000.**

Wis., Milwaukee—Lanham & Co., 4524 N. Oakland Ave., five 28x31 ft. duplex flats. Owner builds. Electrical work, to North Side Electric Co., 4053 N. 12 St.

Wis., Racine—Ace Realty Co., c/o W. H. Miller, 213 6 St., thirty 24x30 ft. frame residences, concrete block fdn., separate contracts. CD 9/29—ENR 10/1.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., San Francisco—TANNERY—Metten & Gebhardt, 1775 Egbert St., rebuilding 2 story, 90x250 ft. frame tannery. $200,000.

Ia., Wapello—GRAIN ELEVATOR—Farmers Elevator & Exchange Co., M. Daily, mgr., Wapello, rebuilding grain elevator. $40,000.

Louisiana—PLANT—Big West Drilling Co., Dallas, Natl. Bank Bldg., Dallas, Tex., natural gas absorption plant, North Lisbon area, Claiborne Parish.

Maine—PLANT—South Portland Shipbuilding Corp., Front St., South Portland, soon lets contract, plant addn. $40,000. A. J. Harriman, 3 Cushing Point, South Portland, engr.

N. Y., Farmingdale—PLANT—Francisco & Jacobus, archts., 511 5 Ave., New York, soon let contract, 2 story top addn. and five 1 story units, and 1 story warehouse, brick, concrete, cinder block, for Industrial Company. Over $50,000.

N. Y., Kenmore (br. Buffalo)—WAREHOUSE, etc.—Eastern States Milling Corp., Ontario St. and Military Rd., concrete, frame warehouse addn., loading shed. $80,000.

Pa., Erie—PLANT—H. J. Williams & Co., J. H. Williams, pres., 225 Lafayette St., New York, N. Y., sketches plant. United Engineers & Constructors, Inc., 1401 Arch St., Phila., engrs.

Tex., Midland—PLANT—Gulf Oil Corp., Petroleum Bldg., Fort Worth, reconstructing oil, gasoline and by products plant.

Que., Montreal—PLANT—Engineering Products of Canada, Ltd., 5035 E. Ontario St., plant addn. $50,000.

Que., Montreal—FACTORY—R. A. Phaneuf, 1959 Bellechasse St., factory.

B. C., Vancouver — PLANT — Western Coal Ltd., 626 Pender St., coal mining plant. $40,000.

Ont., Ottawa—PLANT—Craincraft, Ltd., c/o H. A. Crain, 424 Churchill St., plant. $40,000.

Ont., St. Thomas—PLANT—St. Thomas Bronze Co., Ltd., 21 Wellington St., plans by J. T. Findlay, 17 Hincks St., 1 story brick plant addn., concrete fdn.

Ont., Toronto—PLANT—Duecritt Silver-Cobalt Mines, Ltd., c/o V. M. MacL. Howard, 45 W. Richmond St., mining and milling plant. $50,000.

Ont., Toronto—PLANT—Standard Pattern Co., Ltd., c/o E. N. Johnson, 26 W. Adelaide St., woodworking and metal plant. $40,000.

Que., Beauceville East—PLANT—S. Bolduc, Beauceville East, woodworking and box mfg. plant. $40,000.

Que., Coaticook—GRAIN ELEVATOR, etc.—Agricultural Co-operative Society, 14 Principal St., grain elevator and mill.

Que., Lake Megantic—FACTORY—Roy & Brassard, Lac Megantic, factory, etc. $40,000.

Que., Montreal—PLANT—Ayerst, McKenna & Harrison, Ltd., 485 McGill St., bids soon 1 story, 32x56 ft., 1 story, 43x67 ft. and 2 story, basmt., 35x60x170 ft. laboratory bldgs. St. Mathieu St. near Cote Bertu. $267,000 incl. equip.

Que., Montreal—PLANT—Continental Can Co. of Canada, Ltd., 2600 Mullins St., bids soon altering bldg., Ouimet Ave. near Balmoral Ave., concrete driveway, unloading platform, railway siding, track work. $125,200.

BIDS ASKED

Bids Asked October 14

Maine—PLANT—South Portland Shipbuilding Corp., Front St., South Portland, brick

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Bids Asked

Md., Baltimore—TEST—W...rn Electric Co., 2500 Broening Hy., test ...s.

Massachusetts—PLANT—Bet...hem Hingham Shipyards, Inc., E. How... St., Quincy, (from selected bidders) plant.

CONTRACTS AWARDED

California — CHANGE HOUS... — Industrial Company, 2 story, 30x70 ft., ...ame, corrugated iron change house, to H. J. Christensen Co. and W. E. Lyons Constr. Co., 2009 Pacific Ave., Alameda.

Calif, Marysville—COLD STORAGE PLANT—National Ice & Cold Storage Co., Marysville, cold storage plant, to W. ... Burroughs, 911 5 St. CD 9/24—ENR 10/1.

Calif., San Francisco—BUS DEPOT—Greyhound Lines, 5 and Mission Sts., bus depot addn., to G. P. W. Jensen & Sons, Inc., 320 Market St. CD 9/29—ENR 10/1.

Conn., Glenbrook (Sta. Stamford)—FACTORY—Perkins-Elmer Corp., 535 Hope St., 1 story, brick factory addn., to Vuono Constr. Co., 217 Bedford St., Stamford. CD 8/26—ENR 9/3.

Conn., New Haven—WAREHOUSE—American Steel & Wire Co., 238 Fairmont Ave., 1 story, 40x410 ft., brick warehouse addn. Owner builds. Steel, to American Bridge Co., 71 Bway., New York, N. Y. Est. **$75,000.**

Conn., Stamford — FACTORY — Electric Specialty Co., 211 South St., 2nd story brick factory addn., to Karl O. Haugen, 328 Atlantic St. Est. **$40,000.** J. Chapman, Glenbrook Rd., archt. CD 8/20—ENR 8/28.

Mass., Hingham—PLANT—Air Reduction Sales Co., 60 E. 42 St., New York, N. Y., 1 story, 40x70 ft., brick acetylene plant, to J. S. Mozzicato, 168 Mystic St., Medford. Est. **$40,000.** Bids 9/19. CD 9/18—ENR 9/24.

N. J., Chatham—PLANT—Chatham Building Material Co., 116 Summit Ave., plant, to Simonsen & Emerson, 101 Park Ave., New York, N. Y., over **$50,000.**

N. J., Newark—MILL—U. S. Industrial Chemical Co., 340 Doremus Ave., 3 story, bsmnt. mill and dryer bldg., to Damon G. Douglas Co., 605 Broad St., **$55,000.**

N. J., Port Reading—BOILER HOUSE—Reading Co., Reading Terminal, 12 and Market Sts., Phila., Pa., 1 story, brick, concrete boiler house addn., etc., to Calabro Constr. Co., 527 4 Ave., Elizabeth, **$50,000.**

★**N. J., Ringwood**—MINING BUILDINGS—Alan Wood Steel Co., Conshohocken, Pa., design and construction new bldgs. and rehabilitating existing iron mining bldgs., facilities, to George H. Flinn Corp., 551 5 Ave., New York, N. Y., **$1,500,000.**

N. Y., New York—FACTORY—Farrand Optical Co., Inc., Bronx Blvd. and E. 238 St., optical goods factory, to Brown & Matthews, Inc., 122 E. 42 St., electrical work, to C. E. Zweifel & Co., Inc., 114 E. 32 St. Total est. **$250,000.**

O., Cleveland—FACTORY—Artisan Metal Wks. Co., J. F. Maynard, pres., 11400 Madison Ave., factory addn., to Bolton Pratt Constr. Co., 1276 W. 3 St. Est. **$40,000.**

O., Cleveland—FACTORY—Eaton Mfg. Co., C. F. Ochs, pres., 755 E. 140 St., 1 story, 80-315 ft. and 170x180 ft. brick factory addns., to Cleveland Constr. Co., 3868 Carnegie Ave. Est. **$200,000.** Awarded 9/25. CD 9/10—ENR 9/17.

O., Cleveland—PLANT—Ferro Enamel Products Co., E. 56 St., general contract group bldgs., to Dean W. Rankin, 1836 Euclid Ave., electrical work, to Parker Electric Co., 4505 Prospect Ave. Est. **$250,000.** Christian-Schwarzenberg & Gaede Co., Union Bldg., engrs.

Wisconsin — STORAGE — Harnischfeger Corp., 4400 W. National Ave., Milwaukee, 1 story, 62x77 ft. brick, steel storage plant, concrete fdn., to R. L. Reisinger & Co., 733 N. Van Buren St., Milwaukee. Building Engineering Services, 1105 N. Van Buren St., Milwaukee, archts. and engrs.

Wis., Madison—PLANT—Oscar Mayer & Co., 910 Mayer Ave., meat, canning and packing plant addns., to Leo P. Bauer, 3851 N. 100 St., Wauwatosa, and Fritz Constr. Co., 138 N. Frances St., Madison. CD 7/31—ENR 8/6.

Ont., Ottawa — PLANT — Ontario Hughes Owen Co., Ltd., 529 Sussex St., 2 story, 28x60x120 ft. plant exten., to Ross-Meagher, Ltd., 7 Echo Dr., about **$50,000.**

Ont., Windsor—SHOPS—Canadian Bridge Co., A. S. Ryley, mgr., 1219 Walker Rd., 1 story, 75x75 ft. machine shops, 1 story, 35x35 ft. paint shops, brick, steel. Owner builds. **$45,000.**

Que., Hull—PLANT—Hull Iron & Steel Foundries, Ltd., 207 Montcalm St., plant, to Ed. Brunet & Fils, Ltd., 35 Chemin D'Aylmer St., **$100,000.**

Que., Ile-Aux-Coudres—FACTORY—Cooperative de L'ile aux Coudres, c/o A. Tremblay, Ile aux Coudres, peat factory, day labor. **$40,000.**

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